approach

JULY 1967 THE NAVAL AVIATION SAFETY REVIEW

Fighter pilots must practice firing and exercising their weapons. During the many years that machine guns were the principal air-to-air armament, numerous ways and means to get realistic aerial target practice were invented. Through the years, various forms of towed targets have been the most common system.

A sleeve, made of strong cloth, was satisfactory for many years. The machine gun bullets of each firing plane were painted different colors so that hits on the sleeve could be attributed to each individual fighter.

Special techniques had to be devised to safely and satisfactorily get the sleeve airborne as well as returned. Each model tow plane (usually the unit's equipment) required a takeoff tailored according to the target's as well as the airplane's peculiarities and performance.

Once airborne and cruising at the specified altitude over the target range, the attacking aircraft dove at the sleeve strung out behind the tow plane. The line length was about 1000' which made the sleeve droop several hundred feet further down. Basic safety rules disallowed any attack in the 30-degree cone around the tow line with the target as the apex. If pilots were permitted to settle in behind the sleeve for an easy no-deflection shot, they could also possibly hit the tow plane directly up the line.

Such a restriction meant that pilots must always fire deflection shots at varying angles. Obviously, the greater the deflection, the greater the lead requirement and, as a general result, fewer hits. Everyone knows that the surest way to get hits is a no-deflection, no-lead shot. In actual fact, most real aerial combat victories were acquired by shooting up the adversary's

Practice Makes Perfect

The Evolution of Aerial Target Practice

Some target drones soon to be launched.

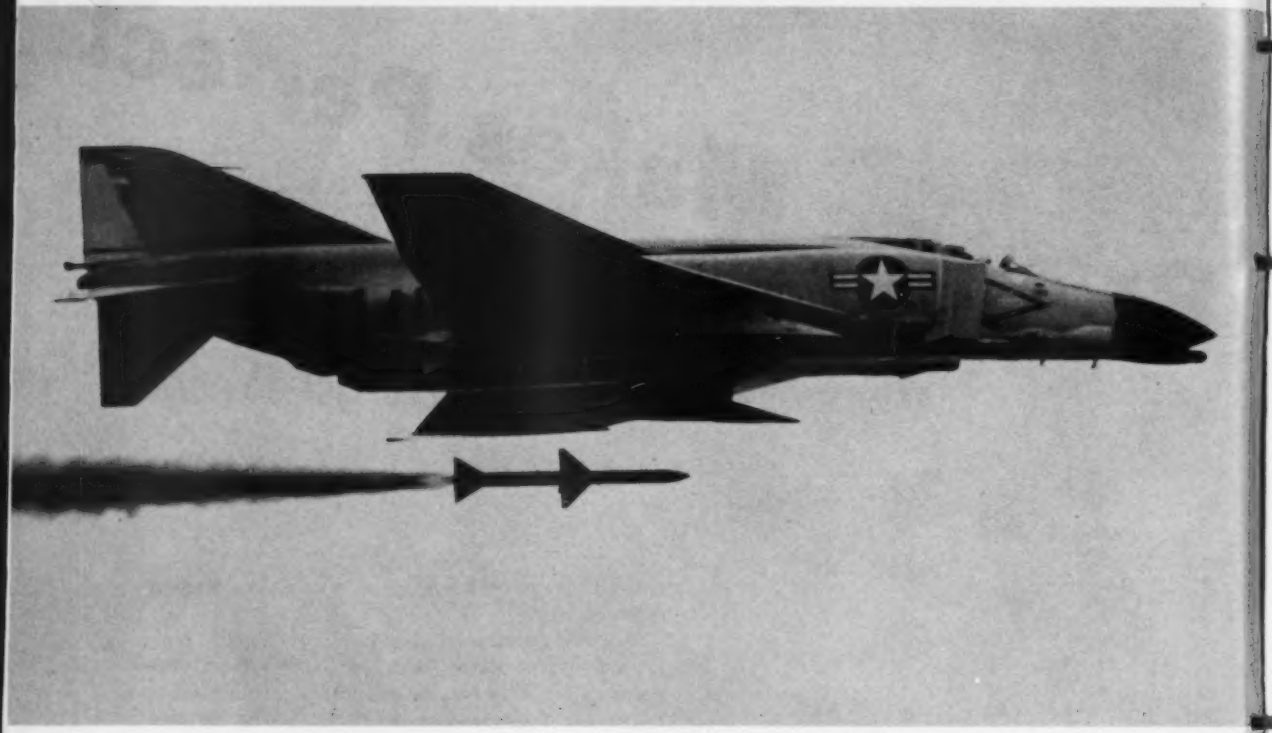
tail with a no-deflection or a minimum deflection spray of bullets.

Gunnery practice always inspired friendly competition. There have been instances where over zealous pilots have become so enchanted with holding the proper pipper lead on the sleeve that by the time they let up on the trigger, they were firing up the tow line. Frequent result—hits on the friendly (and trusting) tow pilot's plane. Some of these incidents have had tragic results.

Other accidents have also occurred such as flying into the sleeve; shooting the tow line apart and then flying into the rapidly decelerating target; collisions between the attacking planes and, sometimes the tow plane; etc. You name it and it probably happened sometime or other.

Toward the end of World War II, a wire mesh banner was introduced to replace the cloth sleeve. To register the bullet paint marks, the wire was thread-wound. This new target was not a sleeve but more like a flying carpet. Moreover, it permitted considerably higher speeds by being more durable than cloth.

Extensive deflection firing practice paid off handsomely for US pilots in World War II. The Japanese had superior performing fighter aircraft but their gunnery was generally confined to the easy, no-deflection, tail shots. While the enemy pilots were wasting time maneuvering into tail positions, our pilots were getting in the first shots by initially accepting the more difficult deflection firing angles. This quick action often whittled down the Zeros so that the



The crew observed the flash of a missile being fired . . .

easier tail shots were subsequently obtained.

Now that air-to-air missiles have become operationally common, there has evolved a requirement for a new system of aerial target practice. This is because the towed target system has unacceptable deficiencies.

Drones Also Require Safety Rules

Drones have made missile target practice more realistic and firing in close proximity to the tow plane is unnecessary. However, a target launch plane is required, and as you might expect, it may not always get out of the way quickly enough.

Recently, an F-4B squadron was having sparrow missile firing practice. One F-4B was assigned to carry and launch the drone. Four other similar models carried live sparrows (with practice warheads) to be fired at the target.

After launching the drone at FL 210 on a course of 150 degrees, the *Phantom II* broke starboard, selected afterburner, made a shallow dive and leveled at FL 200. Steadying on a course of 240 degrees, and coming out of burner, the crew observed the recently launched drone making contrails back at seven o'clock, on a right angle course. Instantly thereafter, they observed two contrails at nine o'clock and considerably higher on a course that was somewhat between them and the drone. A few seconds after reporting this situation on the FAD net, the crew observed the flash of a missile being fired from one of the fighters making the contrails.

Survival instincts must have told the drone carrier pilot that the missile direction was too close to his position for comfort. He said that reflex action encouraged him to take evasive action. At the same time as he transmitted a do-not-fire message, he initiated a hard port turn into the missile, intended as the beginning of an escape maneuver. Unfortunately, it was wrong because a few seconds later a direct hit was scored on the F-4B's starboard side. The impact snapped the airplane on its back but it was spared from full destruction because the missile was equipped with a reduced size practice charge warhead.

After the impact, the pilot still had control of the situation and an attempt to right the F-4 was successful. He then noticed that the starboard engine had dropped to 55 percent rpm although the throttle was still full forward. He proceeded toward his ship calling on Guard and squawking emergency IFF. The

A sleeve made of strong cloth was satisfactory for many years. A 900 ft towline allowed the sleeve to droop somewhat lower than the tow plane.

And a direct hit was scored on the F-4's starboard side.

generators on both engines soon failed and he extended the ram air turbine. The next failure was hydraulics; utility and port engine PC-1. Arriving back over Homeplate he made a half-flap, single-engine, straight-in landing safely to the carrier.

Fortunately, the incident incurred no fatalities and no one person was considered to be at fault. Like many accidents/incidents, a chain reaction of errors set the stage. The controller did not assure the position and identification of the target launcher prior to giving clearance to fire. The target launcher aircraft did not follow the briefed escape path. The firing crew did not derive a warning signal out of the observed deviations from the expected flight path of the drone.

Practice firing with live ammunition (warheads) now has so many restrictions, in the interest of safety, that it sometimes seems to be hardly worth the effort. In short, it is a lot of work. But remember, all the work in the world will not restore a comrade and aircraft brought down by a breakdown of the safety rules. Failure to work hard at being the best with your particular weapons system, may provide an enemy with one-fifth of the notches he needs to be an ace.

Statistical Opportunity

by CDR Fred Bernstein C.O. VT-6

NAS Pensacola

There was no need for a calculated risk—there seldom is—the "statistics" told a glowing story; ahead on commitments by "umpteen" percent notwithstanding the attendant shortages of men, money and material and we had just passed our 30th accident-free month. The weather and its future were just not suitable for training—what to do? Like any other forthright and well organized squadron we'll schedule an all pilots meeting. Great—a chance for a few sea stories, the heads of departments can air their pet theories and the Safety Officer will warn us and counsel us on the dire consequences of an error in flight.

But behold, with the help of modern math—taught by his third grade son—a skeptic in our midst fore-

teils of doom.

"Statistically," this mystic says, "we are bound to have an accident soon."

Rising from his chair and standing squarely in front of the group he reiterates his *magnum opus.*

> "Look, flying has had, has, and will always have accidents. The more you fly the greater the possibility of having an accident. Stop flying and you will stop aircraft accidents, continue to fly and you will continue to have accidents."

Bedlam destroys the calm of a "nice" foul weather day, coffee cups tumble, some smokers butt their cigarettes and the nervous debaters light up. The moment of truth is dawning. Can you argue with statistics, can numbers—those magic-like symbols—be wrong?

Undisturbed, and with the confidence of a scientist, our speaker picks the Acey-Deucey dice off the floor and prepares to demonstrate his thesis.

> "Let's assume these dice are analogous to flight operations and that the combination of two aces means an accident. We all know that if I keep rolling often enough I'll get two aces. Now, there is the proof of the statistics!"

There is a strange stillness. Young studs, old fuds and the lieutenant commanders ponder this wisdom. What to do—Well I could get grounded until after the next accident or maybe even go on leave.

Not wanting to upstage the sage of doom the Safety Officer breaks the stillness and asks kindly,

> "Can you, with the help of statistics, tell us on what day or perhaps even better what hour this accident will occur?"
>
> "No," says our statistical friend, "but it's bound to happen soon, we are long overdue."
>
> "Can you," asks our Safety Officer, "tell us what will cause the next accident?"
>
> "No, not exactly, but it will most probably be pilot error, maintenance error or supervisory error and in that order of probability. Statistics guarantee that."
>
> "Then," says the Safety Officer, "you will admit that accidents have a cause and the most frequent cause is the pilot."
>
> "Well, yes, I suppose so but it's related to the inability of the pilot to do right all the time which means there is a statistical probability that error will occur and an accident will occur."
>
> "Can we," our Safety Officer continues, "conclude that statistics tell us that accidents will occur and they will have a cause? These are statistical truths; is this so?"
>
> "Hold on now! Don't be twisting my words; statistics prove you can't eliminate accidents. Why look at the resources that have been pumped into any number of safety programs. Let's face it, the statistical probability of an accident is a fact indisputable since Orville and Wilbur decided to go flying."

Departing from the historical tidbit our Safety Officer pleads,

> "Granted, statistics are a record of what has happened, and they certainly testify to the fallibility of men and machines, however statistics cannot cause nor has a statistic ever been responsible for an accident. You and I and every officer and man in this squadron can cause an accident. Why we even get help from the AMD, the NARF, the airplane builder, and our friends next door."
>
> "That's exactly what I'm saying, the odds are against a perfect safety record. Every time we strap on a bird we take a chance and as long as the odds are against a perfect safety record we will have an accident; statistically . . . ."
>
> "No," our Safety Officer interrupts. "Every time we go flying we have an *opportunity* to perform with or without an accident. If we ignored training, the need for maturity and supervision, we would undoubtedly perform poorly. Aviation safety programs and the entire effort of our maintenance program is to give every pilot the *opportunity* to perform competently, efficiently and safely. Flying is not inherently a risk or chance situation. People—pilots, maintenance personnel, manufacturers and designers—cause accidents through their inability to take the *opportunity* to perform in such a fashion as to preclude an accident. Accident statistics are nothing more than a tool to illustrate what has happened in the past. They offer no power or promise for the future. Each successful flight adds to the watershed of knowledge which can further the opportunity to fly without an accident. Odds are related to games of chance, we are certainly not rolling dice or tossing coins when we fly."

The Socratic exchange is interrupted by the entry of the Training Officer who exclaims:

> "The field will be marginal VFR in about five minutes, there's a good hole about five miles wide over the water. Let's get everything out, but keep a sharp lookout for other aircraft. We won't beat these completion statistics sitting around telling lies to each other."

As the Ready Room empties the squadron jester adds:

> "Like he said, 'Here's an opportunity.' "

COMPLACENCY

By William E. Evans III, M.D., Flight Surgeon, Lockheed-California Company

On final approach the fighter was observed to be low, and the pilot radioed that he was going around. Subsequently, the jet assumed a nose-high attitude from which the pilot was unable to recover. The low-altitude ejection was unsuccessful. Was this a low-time pilot transitioning to a high-performance aircraft? Negative! The mach jock had 3000 jet hours and 700 in type.

The accident board found no mechanical cause for the accident. The flight surgeon ruled out physiological problems. What stress contributed to the pilot factor that caused this accident? There was no fluttering fledgling at the controls in this mishap. This was a mature, highly proficient pilot. The weather had been clear; there was no other traffic; the pilot had logged eight hour's sleep and had a full breakfast. The common psychological sidewinders such as disorientation, preoccupation, sensory overload, habit interference, and distraction were called forth and discounted. One major factor emerged as the single most significant contributing cause—*complacency*.

In this case the harmony between man and machine had been lacerated by a most insidious factor. This factor fatale comes in a variety of disguises. Sometimes it poses as overconfidence; at other times boredom, and at still others, it is indistinguishable from inattention. The usual name applied to this factor is "complacency." It is a state of mind characterized by contentment. In this respect it is unlike other mental stresses; as a matter of fact, you might consider it a kind of "anti-stress."

The origin of complacency is found in confidence, an indispensable trait for the successful pilot. All pilots have confidence levels which are determined by their past experiences, training, and types of personalities. For some their confidence level is proportional to the number of operating engines or redundancy in avionics. As a pilot's learning curve in a new machine begins to flatten out, decisions become easier and flying becomes more routine.

Take the case of a pilot transitioning to a high performance aircraft. The stresses inherent in this transition period are a strong motivating force in the acquiring of the skills and knowledge necessary to master this new bird. As the combination of training and experience gives rise to confidence, stress is no longer a factor and complacency frequently moves in to fill the void left by stress. Complacency, then, may be defined as a state of confidence plus contentment.

The earliest effects of complacency are subtle erosions of the desire to remain proficient. The preflight becomes less complete and more automatic. The pilot is less attentive to the care of his oxygen mask and survival equipment. The ejection seat merely gets a quick once over. Items dealing with his personal safety are those most frequently neglected by the complacent pilot. In addition, because of his success in mastering his environment, he becomes increasingly likely to play a flight by ear rather than plan ahead for possible contingencies. It would appear that complacency is a state not too far removed from spring fever. There may even be physical symptoms such as a gradual increase in weight and a general decline in physical condition caused by lack of attentiveness to physical programs.

Like a pilot who suffers from hypoxia, the complacent pilot is unaware of the gradual deterioration in his performance. He loses the ability for critical self-appraisal. His adrenal glands seem to have gotten drowsy. Boredom and inattention are the chief cock-

A PILOT'S DILEMMA

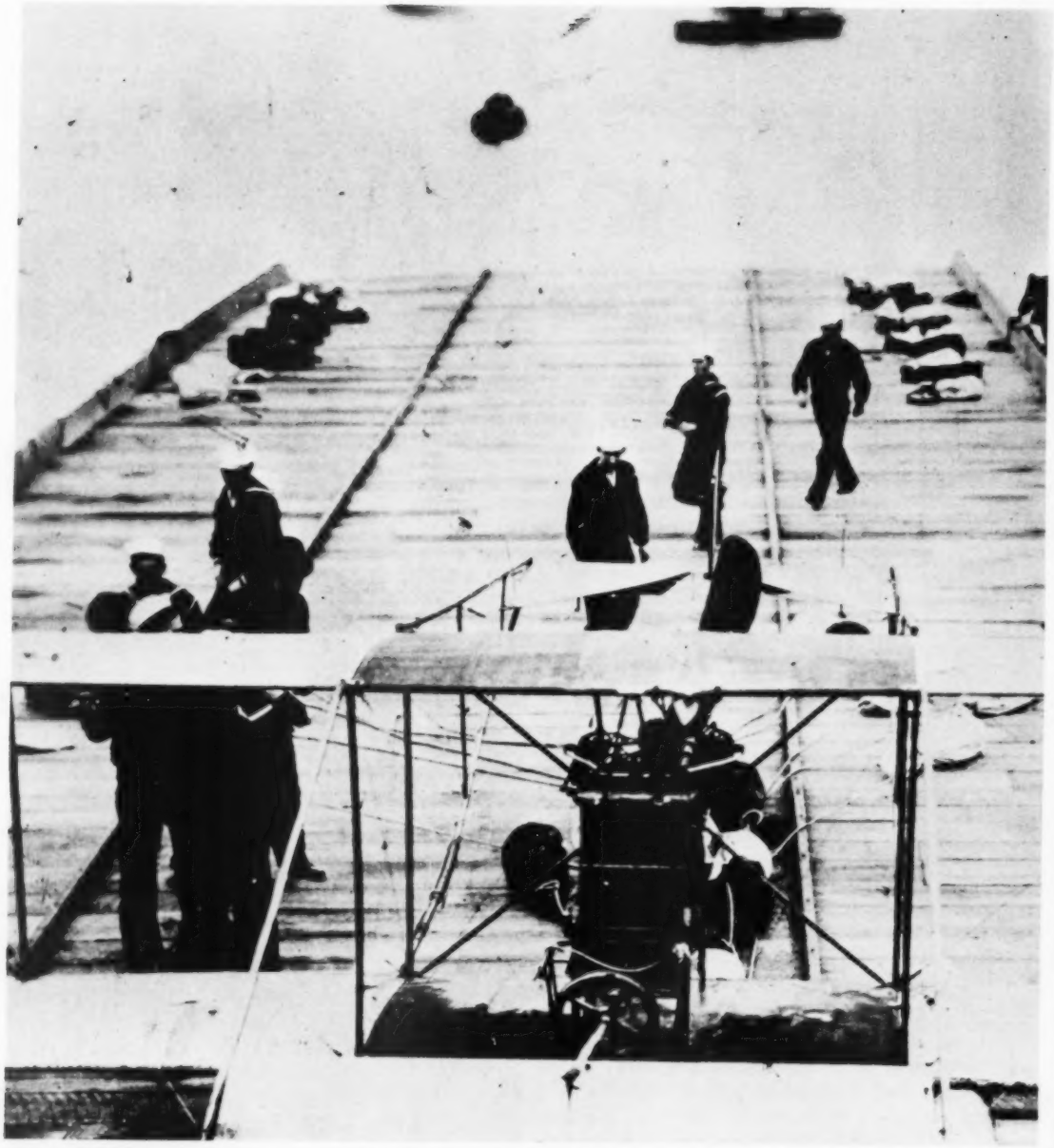
pit manifestations of complacency. *Fat, dumb, and happy* sums up the condition better than any mouthful of erudite psychological terms.

To make matters worse, complacency is reinforced by a squadron's good safety record and the acknowledged mechanical reliability of a particular airplane. Not infrequently a squadron goes for long periods without a major accident only to have a rash of accidents which can often be traced back to a complacent attitude. Instead of profiting from the incidents and accidents of others, the complacent pilot says, "This can't happen to me." These cherished thoughts about one's immortality may bolster the ego, but they expose the flesh to a variety of adversities. Although complacency may be the cause of a major event like a midair collision or an episode of fuel exhaustion, for the most part it induces minor accidents and incidents. Taxi accidents and other minor ground incidents are frequently the result of a complacent pilot's actions.

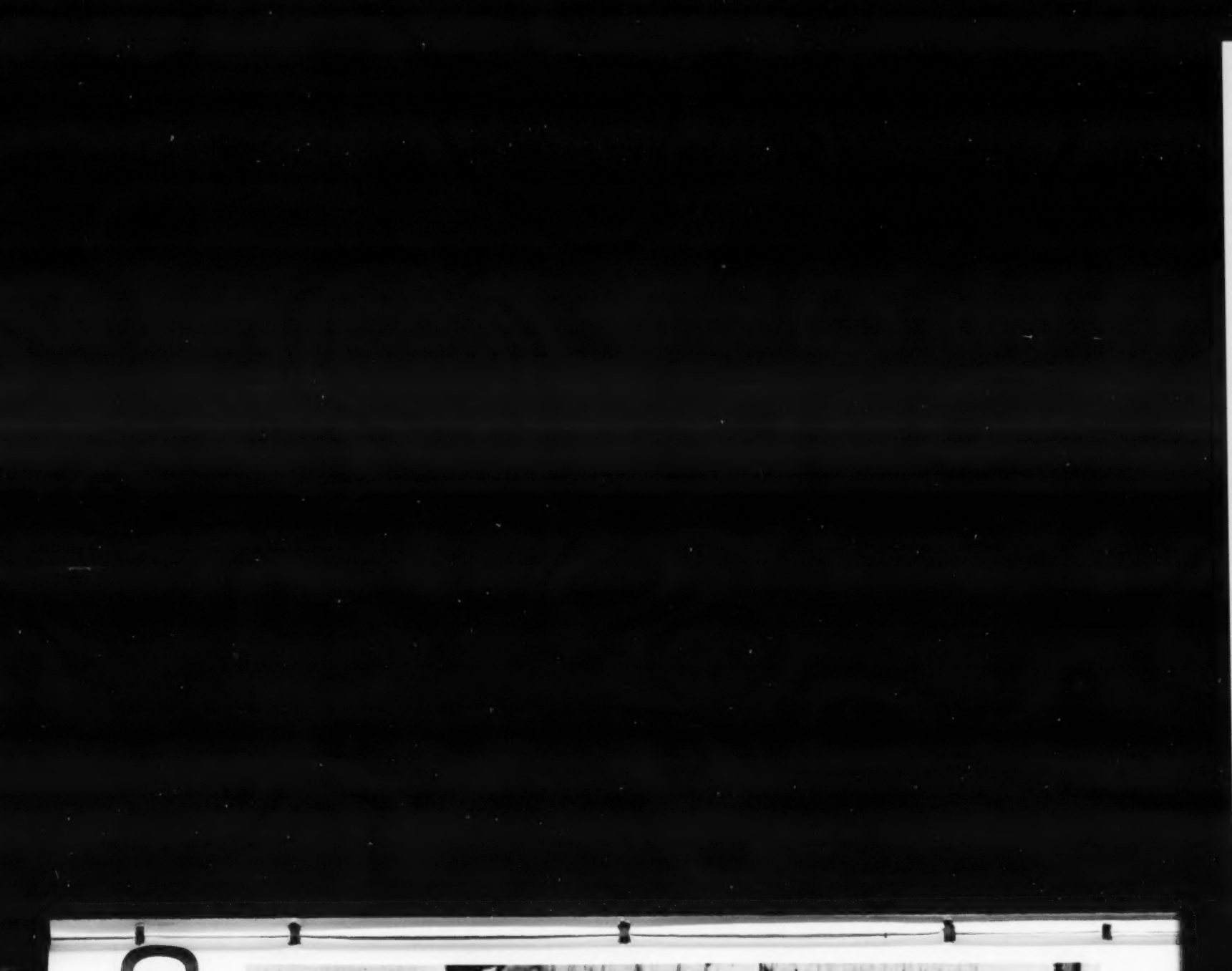
Complacency is easier to prevent than cure. On the supervisory level it is essential to realize that some degree of complacency is inevitable in all pilots. Only a thorough and vigorous program of proficiency provides for habit reinforcement and assures high skill levels. The pilot may help prevent complacency by developing a very high standard of perfection, not only for his flying performance but for his physical and mental condition as well.

Because of the disarming nature of complacency and because it is associated with experience and confidence—both qualities of high-time pilots—it is a frequently overlooked factor. Increased vigilance and determination on the part of pilots and supervisory personnel are required to prevent its effects.

TOWARD



First arresting efforts were lines across the deck anchored to movable sandbags.



BETTER ARRESTMENT

By COL J. H. Reinburg USMCR (Ret.)

Arresting wires are normal to carrier operations but their installations on airfields are for emergency or precautionary use. Aboard ship, barricades are the means of emergency arrestment.

When the first experiments were initiated to land aircraft safely aboard ships, the need for stopping assistance became self-evident. The original arresting efforts were lines stretched across the deck anchored to moveable sand bags.

With the operational availability of the first carrier, LANGLEY, the foundation was established for the present arrestment system. Steel cables on the deck and steel hooks on the aircraft became SOP.

The trend in naval carrier aircraft has been steadily toward higher landing speeds and heavier aircraft. This has consistently necessitated constant improvements in arresting systems.

When jet aircraft became common in the Navy, the higher landing speeds compounded operations, especially on runways. The pavements have been lengthened at no small expense. Money and/or terrain availability frequently precluded many airport runways to be lengthened sufficiently. With years of arrestment experience on aircraft carriers, it was a logical move for the Navy to incorporate emergency arrestment systems on their land airports. Half the job was essentially a reality because the tactical aircraft already had tail hooks. The old sand bag idea again fathered the first emergency installations. Surplus anchor chain was laid lengthwise along each side of the runway. A cable was stretched across the runway connecting the downwind ends of the chain. When a tail hook grabbed the cable, the chain was paid out one link at a time until the ever increasing weight of additional links stopped the aircraft.

The Air Force has recognized and experienced the requirement for emergency runway arrestments. Consequently, tail hooks have become standard equipment on their tactical aircraft. Both services have emergency arrestment gear on all of their operational airports approved for use by jet aircraft.

The March 1967 issue of APPROACH tabulated present day aircraft arrestment equipment and gear designed to stop aircraft. When hook and/or wires fail or cause trouble, the causes should be studied and every effort made to achieve perfection. To illustrate, some arrestment difficulties are herewith narrated. They cover many situations where there have been difficulties with arrestment equipment.

An Arrestment Landing for Double Safety

After two normal FMLP bounces, the pilot of an F-8E approached the LSO who waved him off because the starboard MLG was down but canted and the port MLG was UP. The pilot double-checked the gear handle and verified it was DOWN but a persistent barber pole indication confirmed trouble. Utility hydraulic pressure held steady at 3000 psi.

While a runway was ordered to be foamed for an emergency arrested landing, the *Crusader* was refueled inflight. Then the pilot practiced three approaches to the morest gear for good measure. When he felt ready for arrestment he was advised to actuate

First indication of trouble was a canted starboard MLG.

the emergency pneumatic system to blow down the gear. All three wheels then indicated DOWN and LOCKED. Immediately thereafter the utility hydraulic pressure went to near zero. A safe and undamaged arrestment was made into the morest.

Investigation revealed a failure of the O-ring packing and its ring back-up. When the gear was blown down, the utility hydraulic fluid vented overboard as the air pressure did its designed duty. Here is an outstanding example of all hands on the ball, with maximum and correct utilization of emergency arrestment equipment.

New Pilot Arrestment Problems

A student pilot was scheduled for carquals in a TF-9J. His first approach was waved off for carrying too much power, overshooting and being too high in close. After a successful second pass touch-and-go, the pilot approached for the third time. The LSO instructed him to bring it up. The pilot promptly corrected for a good start position, but left on too much power and the *Cougar* was observed to rise. A moment later, the pilot made corrections and the LSO decided the plane was all right for a touch-and-go. Approaching the ramp, the LSO thought the plane still looked good. A moment later a high sink rate commenced and the LSO radioed, "Bolter, 100 percent, rotate."

The aircraft made a hard landing favoring the left MLG which collapsed allowing the left wing tip to strike the deck. With full power on as directed, the pilot got the *Cougar* back into the air safely and was given Pigeons' to home plate, escorted by the airborne safety pilot. Enroute, the pilot noted that the pitot tube was damaged and there was no airspeed indication. The angle-of-attack instrument however, substituted adequately.

The pilot made a safe arrestment on a foamed runway. During runout after engaging the wire, the left wing dragged causing the airplane to skid off the left side of the runway before stopping. Here is a case where student pilot techniques resulted in extensive damage to the bird but a total loss was saved by preplanned emergency arrestment.

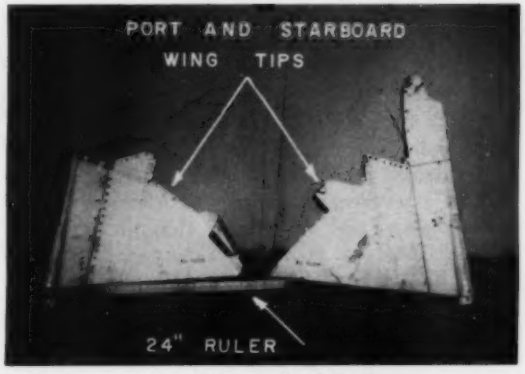
The "Phantom" Wire Cutter

This is a classic of sorts. A crew was scheduled for night FMLP in an F-4B. Everything continued to function normally after takeoff. The plane was too heavy to immediately commence the bounce period so the pilot performed some simulated instrument work. Then an unhooded tacan penetration with a GCA pickup to a touch-and-go landing was started soon after dark. The final controller took over when the F-4B was nine miles out. He directed the pilot on a

Without arresting gear, the damage would have been greater.

When the *Phantom* struck the mound-ditch combination . . .

. . . the MLG was mangled and



. . . both wingtips fell off.

straight-in approach to the duty runway. The aircraft was established on glide path at three miles and at the half-mile point the final controller instructed the pilot to take over visually. Thereafter, the controller continued to give advisory information stating that the plane was on glide path and on course until touchdown.

The First Landing

The pilot said he did not see the meatball as he approached touchdown. This caused him to believe that he might land short so he increased his throttles almost to the military power position. The effort was slightly too late because the wheels of both main landing gears touched the ground 49′ short of the runway. The wheels continued to roll on the surface while the prevailing nose attitude kept the nose wheel airborne. Just before reaching the runway pavement, the main wheels struck an 18″ high mound of dirt and then bounced in and out of a trench. This caused the port main landing gear strut to fail at the trunnions and it separated from the aircraft. At the same time the starboard main wheel failed at the axle assembly and rolled on down the runway alone. The impact also caused the port and starboard trailing edge wing tips to fall off.

Upon glancing in his rear view mirror, the pilot saw sparks as he staggered down the runway on the nose landing gear and the starboard strut. This motivated him to firewall the throttles. The twin afterburners got the aircraft back in the air after scratching up 2000′ of the runway.

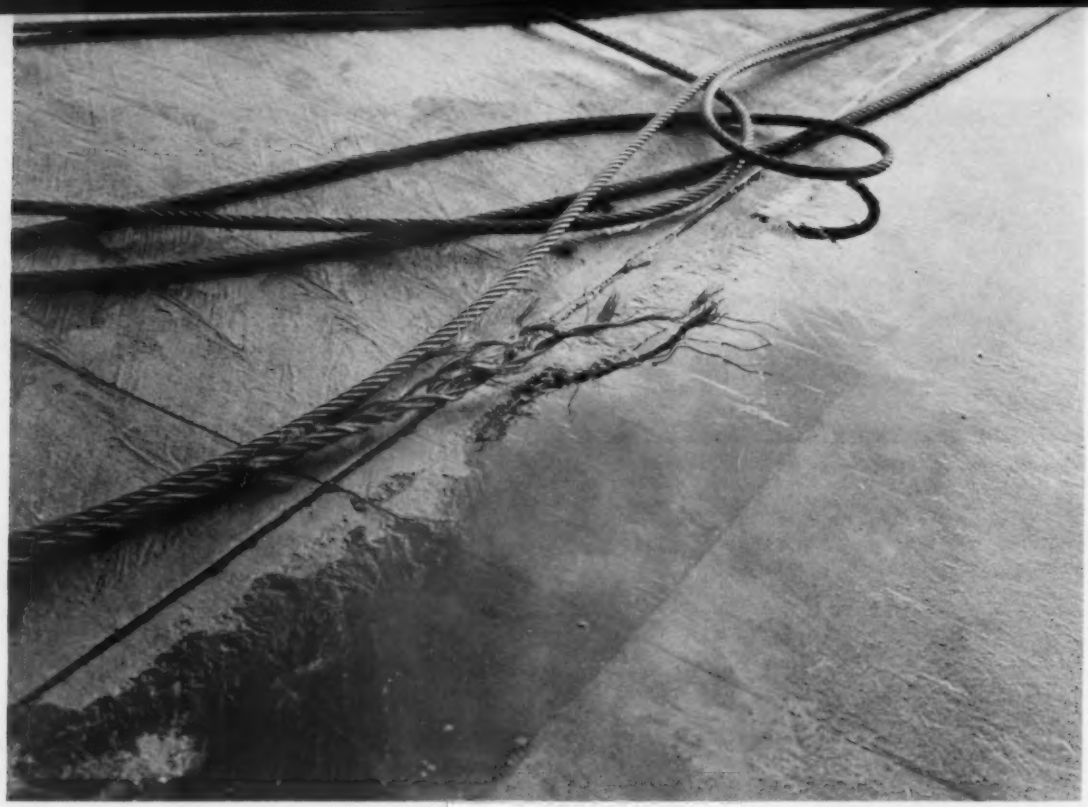
The Second Landing

Upon getting safely airborne and commencing to circle the airport, the pilot contacted the tower operator who confirmed seeing the sparks. Clearance was requested and granted to fly close to the tower for an effort to ascertain aircraft damage. Meanwhile, the LSO arrived at his station on the runway and accepted the inspection request. Before the first low pass could be made over the LSO, the pilot noticed a hydraulic gage warning light and this led to him detecting a low PC-1. Quickly thereafter the PC-1 went to zero and the pilot extended the RAT.

The low pass over the LSO was next to useless because of the darkness, and too little time to operate the aldis lamp. Nevertheless the LSO thought he could detect a ragged shredded starboard main tire (he was unaware of the missing wheel).

The LSO recommended a short field arrestment. The tower cleared the pilot to make an arrested landing on the off-duty runway which was the standard emergency selection to preclude closing the main runway.

The LSO instructed the pilot to make a low pass to establish proper alignment. Upon approaching, the pilot blew the gear and flaps down pneumatically as an extra precautionary measure. Being at the end of another runway, the LSO could not get over to the approach end of the newly selected runway in time to observe closely but he and the tower operator ascertained as the *Phantom* went by that the pilot was ready to attempt a landing. The pass came within 500′ of the LSO and, this time,



On each pass the stub MLG cut the pendants.

his aldis lamp revealed that the hook was down as well as the remainder of the landing gear.

The next time around, the *Phantom* seemed to be lined up and touched the pavement about 1000′ down the selected runway. Just before touchdown the pilot secured the port engine. When the remnants of the main landing gear touched the concrete more sparks were observed and the port wing settled onto the runway. Both crossdeck pendants were severed and the aircraft commenced arching to the left side. The LSO radioed to the pilot to "stay on the deck." Before the LSO finished speaking, the pilot, who didn't like the idea of sliding off the runway, slapped the starboard engine into afterburner. Shortly thereafter, the F-4B leaped back into the air. Realizing he needed all the help possible to stay airborne, the pilot was quick to get the port engine going again. Fuel state was then down to 3200 pounds.

The Third Landing

Another radio conference ensued between the pilot and the LSO. It was decided to make some more close flyby inspections. Two such zooms only further confirmed a useless landing gear, but an apparently still usable hook. The pilot was told to orbit while foam was spread on another runway for an approach into the water squeeze arresting gear. One thousand pounds of fuel remained when the pilot began his approach. He touched down 3000′ short of the water squeeze pendants. The plane was again supported by the nose gear, the left wing and the starboard main mount stub. No luck. He severed the two crossdeck pendants and when it became obvious that an arrestment was not to be made he selected military power and was quickly airborne again. The LSO informed the pilot that he suspected the MLG was cutting the pendants but no solution was promulgated.

The Fourth Landing

The air station still had another set of pendants hooked to the anchor chain 10,000′ down the duty runway. Eight hundred pounds of fuel remained when the determined pilot decided to attempt one final try into the last arresting arrangement. Unfortunately, his luck was still running bad because his landing gear stub cut the wire again and he elected to get airborne once more.

Owing to the low fuel state, the pilot pointed the ground-shy *Phantom* toward the nearby seacoast for an overwater ejection. Enroute while climbing through 1500′, the aircraft snapped violently 90

degrees to the right. The pilot regained control and upon crossing the shoreline, the crew successfully ejected. The sea claimed the F-4B.

Even though time was short after the first arrestment attempt (the second landing), the ODO and RIO (in the plane) consulted their F-4 NATOPS Flight Manuals hoping to find the best advice for the pilot. Unfortunately, no one knew the true condition of the still airborne *Phantom*. Regardless, the manual did not cover the existing condition of one MLG missing and one stub. If it had been daytime it is possible that the pilot might have held the MLG off the deck so as not to cut the last set of pendants and yet make a catch with the hook. Such precision flying at night, unfortunately, was next to impossible.

An addition to the F-4 NATOPS Flight Manual has since now been incorporated to cover such situations.

Bouncing Hook

An F-8E was airborne on a test flight. Upon coming out of afterburner, the pilot observed the engine oil pressure drop to 29 psi. At the same time warning lights came on for the engine oil, hydraulic pressure and engine fuel pump.

The pilot reduced power to 87 percent and called for immediate landing at his nearby home field. Meanwhile, the oil pressure appeared to stabilize at 29 psi. Crossing the threshold, the *Crusader* was indicating 190 kts at idle power. Touchdown was 1000′ short of the arresting gear. The F-8 passed over the cables at 175 kts without the hook engaging. Past the 7000′ marker speed had only slowed to 160 kts so the pilot elected to get airborne again for another try.

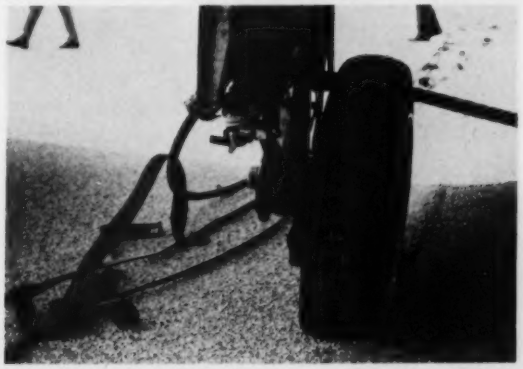
Oil pressure was still holding and the next touchdown was at about 150 kts. His hook missed the arresting gear again but by securing the engine, the pilot was barely able to brake the *Crusader* to a safe stop at the end of the long runway. The hook was assisted in rhythmic skipping by the excessive velocity. It stands to reason that the degree of hook bounce is directly related to speed thereby reducing the chances of catching a pendant.

Excess speed aggravates hook bounce.

Unwanted Arrestment

Four *Tigers* were cleared for a formation afterburner takeoff. When indicating about 110 kts the flight rolled over the emergency chain arrestment gear (set for landings in the opposite direction). The No. 4 pilot was on the extreme right position and therefore slightly aft of the other three F-11s who were in a V formation. The wheels of the first three aircraft passed over the cables in such quick succession that oscillations and whip were induced. This caused the No. 2 arresting cable to swing up over the port MLG wheel of the No. 4 *Tiger* and snag the upper arm scissors of the strut. This in turn caused the port MLG to separate from the aircraft. Immediately the aircraft fell over on the port wingtip and commenced a gentle left swerve. Simultaneously with the wingtip touching the runway, the pilot secured the engine then brought the aircraft to

On a formation takeoff an arresting cable snagged the MLG . .



The arresting cable caught the main mount instead of the hook.

a safe stop off the left side of the runway.

As a result of this and several similar accidents, it is concluded that formation takeoffs of this nature should not be made over arresting cables which cannot be recessed into the runway.

There have been many tire blowouts on takeoffs. Quite often it has been established that if the tires are on the weak side, the emergency arresting cables laying across the runway have caused them to fail. Consequently, this peculiarity should be kept in mind on all preflight inspections.

Broken Hook Troubles

At the completion of mission training the flight of A-4Cs proceeded to CCA marshall and separated, entering holding individually. The CCA of pilot X was normal with only minor corrections being required to maintain the desired flight path. Slight variations of the aircraft on the SPN-35 glide slope were evident. A slightly high start on the visual glide path continued, resulting in a "high all the way, too much power" comment by the LSO. The aircraft was flat at the ramp, flying over the wires and touching down just forward of the No. 4 crossdeck pendant. The ensuing bolter and CCA pattern were uneventful.

The glide slope interception on the next approach was slightly high and the aircraft continued high, correcting to "on glide path" (SPN-35) at the time that the pilot called "ball." This was followed again by going slightly high "in close." A correction was made and the aircraft rapidly went low. The LSO called, "Put the power on," "Power!" then "waveoff!" Simultaneously, the waveoff lights were activated. Full power was applied sometime before the aircraft impacted the ramp with a nose-high attitude, ascending slightly at the time of contact.

Upon striking the ramp the starboard main landing gear sheared below the main strut assembly, the port main landing gear was damaged and the starboard external fuel tank separated from the aircraft. The arresting hook shank sheared about one foot above the hook point.

The aircraft boltered and became airborne. Visual inspection by another aircraft determined the damage incurred. Communications with the pilot substantiated that the flight could be safely continued until the other aircraft could be recovered. Meanwhile, the pilot attempted to refuel from an A-4 tanker. Refueling was unsuccessful due to a tanker malfunction. Upon completion of the recovery of the other aircraft, the pilot was vectored for a CCA while the barricade was being rigged.

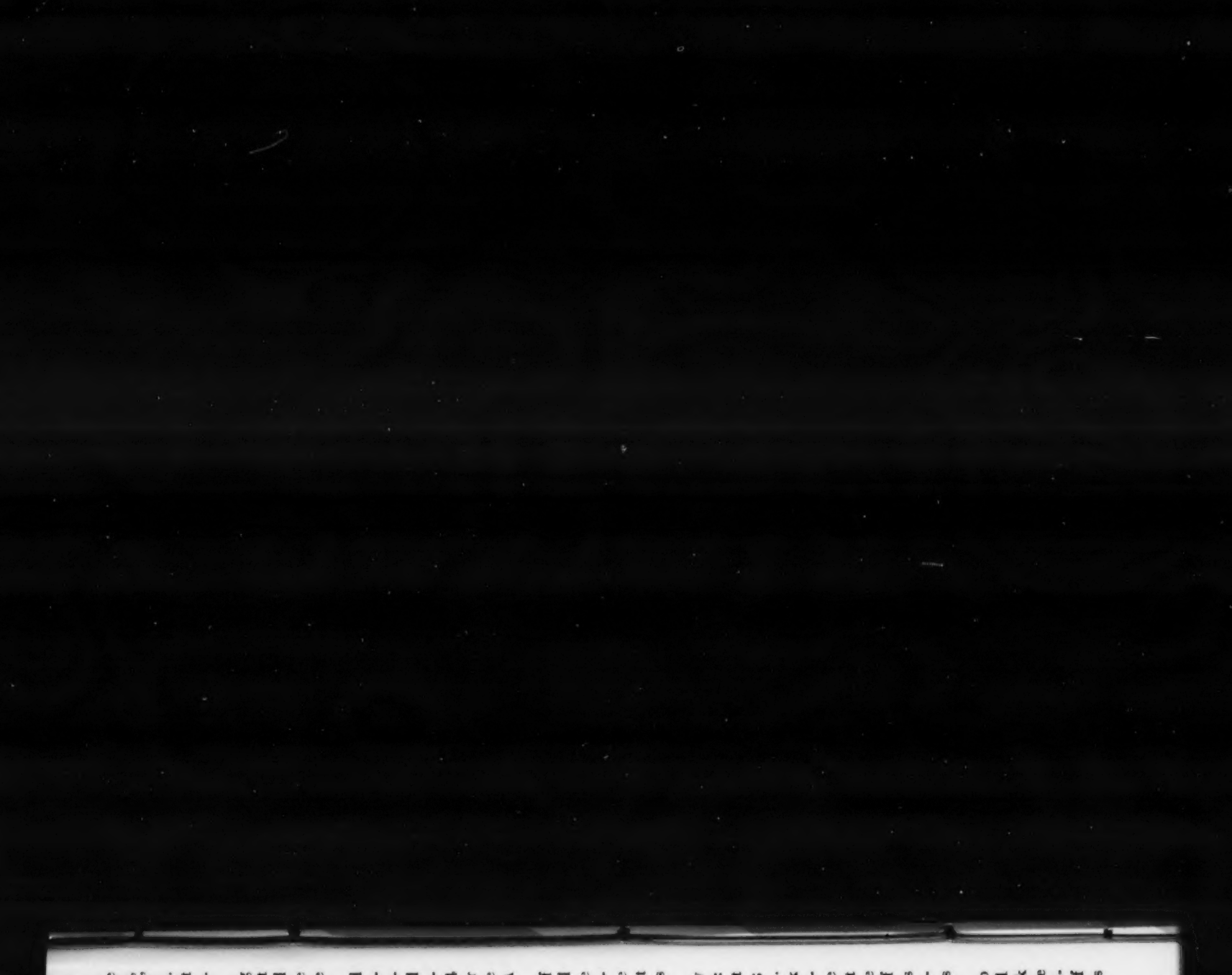
The final pass was effected with the assistance of an LSO talk down. The aircraft made a normal approach and touched down slightly before the barricade. After a successful barricade engagement the aircraft's engine was secured. With the assistance of the crash and salvage crews, the pilot exited the aircraft uninjured and the aircraft was expeditiously removed from the landing area.

A broken hook on CV operations automatically dictates an emergency situation of three alternatives: (1) A barricade landing with some possible aircraft damage; (2) Bingo to the beach if fuel permits or; (3) Ejection where the aircraft becomes a total loss.

Arresting systems are like aircraft; they only work when used properly. In general, to assure safe emergency arrestments on runways pilots must: have proper approach speed for the specific model aircraft in use, drop the hook sufficiently early to ensure catching a pendant, align as close to the center (of the carrier's angled deck or airport centerline) as possible and know by memory the NATOPS instructions for both normal and emergency arrestments for the aircraft model being flown.

Formation takeoffs from airfields can get into trouble with the wires as mentioned in the F-11 accident. The cross-runway wires have caused weak tires to fail on both takeoffs and landings. Excessive speeds contribute to hook bounce. Keep these peculiarities in mind along with the valuable assets of arresting equipment and all of your arrestments will be routine.

Without a hook, the barrier was used.



The Tiger Trap

Combat training requires a pilot to exercise his judgment and aeronautical skill in situations that closely parallel what may be found in actual warfare. But in the hothouse of simulated conditions some realistic aspects of combat are always lacking —including, notably, fear for one's life. This lack of fear is comforting, but it can also lead some pilots to drive a wedge of aggressive overconfidence between good judgment and proper procedures. As a result neither receives the attention that would normally be given it under more routine, less demanding conditions.

The narrative that follows was drawn from the report of an F-8 pilot who, by his own boast, had "never lost a hassle"— at least not until his battle with the principles of aerodynamics.

"On command the section leader took a separate heading and the hassle was commenced. After what seemed 15 minutes or so I wound up at approximately his 120-degree position and I would estimate 6000′ below him coming out of burner. I shallowed out my climb and went back into burner.

"I was turning into him with, I would imagine, 4 to 6 G on the aircraft in what I thought was a more or less level attitude. The nose started to sweep back and forth so I let go of the back pressure and attempted to level my wings. I was at 200 kts and I saw the roll stab light ON. The next thing I remember, I was spinning to my left.

"I let go of everything to try to get the droops down. My first try was not successful as the G forces were a little stiff but I rammed the droops down and got the stick back in my hands. (*The pilot later recalled at this point having also pulled back the throttle.*—Ed) I applied opposite rudder and back stick with the spin. It seemed that I only made about one and one half turns before it started to reverse. I neutralized the controls and it stabilized.

"The last altitude I could remember was 12,000′ and dropping. I definitely had the spin stopped and I started to pull back when I heard my wingman call, 'Jump out!' I would estimate my altitude at 7000 or 8000′ and (going) straight down. I used the curtain and was smartly discharged . . ."

The flight had been cleared by Center to operate VFR in a Restricted Area between flight levels 240 and 310 under positive control. But at the time he entered uncontrolled flight the pilot was 6000′ below his wingman, who recalled being at that time between 20,000 and 21,000′.

Since violation of the clearance had put him at 15,000′ to begin with, and since it takes 6000 to 8000′ to pull the *Crusader* out of the bottom of a spin, ejection in this case was the proper means of solving the problem. If he had used the proper flight procedures when the bird first entered uncontrolled flight the situation could have been alleviated much earlier. This tarnished tiger's use of aileron to level the wings no doubt led the aircraft directly from uncontrolled flight into a spin. If he had effected recovery of control before the airspeed fell off, the stall/spin sequence could have been avoided entirely. As it turned out, his first entry into the lossers' column was an expensive and educational proposition.

Short Snorts

Bang, Bang

Four A-4Bs were conducting formation practice. After a series of rendezvous, break-ups and parade maneuvers, the leader signaled for the final rendezvous prior to going home. Number 2 man was about closed up on the flight leader when the number 4 pilot radioed the presence of a bogie at 3 o'clock. Number 2 pilot shifted his gaze to locate the bogie. A few seconds later he was suddenly alarmed to realize he had closed dangerously near to the flight leader. He quickly reduced his throttle setting slightly, pushed over and rolled left. A moment later he lost sight of the leader as he became inverted. The underside of his nose (which was now right side up) struck the underside of the leader's port aileron. This was quickly followed by several fuselage-drop tank crunches before the two *Skyhawks* got clear of each other.

Both pilots performed slow flight checks at altitude on their aircraft in order to determine characteristics and both did get back on the deck without further difficulties.

This incident points out the necessity for maintaining constant visual contact with lead aircraft during join-up, maintaining a controllable rate of closure on join-up, having a plan for collision avoidance and executing that plan *before* it is too late. All planned collision avoidance maneuvers should be such that visual contact is never lost.

The drop tanks were crunched.

And the wingman's nose section was jarred loose.

So What's New In Emergencies?

While operating jointly with other helicopters on a low altitude ASW competitive exercise, an SH-3A copilot established a stable hover at about 40′. Upon scanning the engine instruments, the pilot noticed that the No. 1 (port) turbine engine T_5 temperature was reading abnormally high. As he was making the copilot aware of the discrepancy, a loud bang was heard above them. The noise came from the location of the No. 1 engine. The T_5 gage which they had been watching rapidly leaped up to about 950°, and engine RPM dropped to 30%. Instantly, the crew recognized a compressor stall.

The combination of a heavily loaded helicopter and a low altitude hover was most inopportune for the bird to continue remaining airborne. Although the copilot rammed the starboard engine up to full power, it was not enough to transition the machine into forward flight before settling on the water. Additional altitude was required to attempt a single-engine recovery.

Fortunately, the SH-3A has emergency water landing capabilities so that by momentarily overtorquing the starboard engine to 115% rpm a few feet above the water, a gentle landing was accomplished. Another stroke of luck prevailed; the sea was almost calm and the now waterborne helicopter experienced no difficulty in making like a boat. To negotiate the three miles to the nearest beach, the one good engine had to be operated at near full power. Enroute, several attempts to make the port engine do its part only resulted in repeated compressor stalls, so it was finally secured.

With landing gear up, the crew found that the good engine aquaplaned them along at about 10 kts with adequate control at all times. Prior to beaching, the two passengers and some equipment were unloaded, the landing gear lowered and the rotor blades brought up to maximum RPM in flat pitch. Following this procedure, two momentary pulls on the collective pitch control were enough to jump the helicopter high and dry onto the beach.

The helicopter high and dry on the beach.

After an on-the-spot engine change, the SH-3A made an easy flight back to home base.

One could only hope for such text book routine on emergencies, but in this incident it is obvious that a high degree of proficiency and training was in evidence.

A Slight Crunch

The pilot of a UH-34D helicopter was cleared to land on the carrier's number 2 spot (the first spot on the port side forward). The approach angle was acute so that about 50 yds from the flight deck, he was slightly aft of the approved spot and heading perpendicular to the flight deck. As the pilot started to turn the aircraft towards the spot, he experienced a loss of RPM from 2800 to 2550.

In an attempt to regain RPM, the pilot depressed the collective pitch control lever. In the sudden loss of altitude which resulted, the port MLG missed the flight deck and went into the port catwalk, allowing the underside of the helicopter to strike the edge of the flight deck. An instant later RPM increased sufficiently so the pilot was able to regain altitude and make a normal landing on the designated spot. The turbulence of a 14 kt wind possibly contributed to the pilot's difficulties.

This incident points out the dangers of acute approaches which can result in a loss of rotor RPM at a critical moment.

Who Do You Trust?

Taxiing back to the line via a nonstandard taxi route, the pilot of an SH-3A noticed that limited clearance was available between a line of S-2s and an opposed line of SH-3As along his path. After hesitating a bit, he complied with tower directions to taxi between them. At the time there were seven or eight linemen positioned at critical points of access to the lane, each of whom was giving him a thumbs-up.

As he gingerly taxied forward, clearance closed to a minimum. With some of the linemen still giving thumbs-up signals, the main rotors of the taxing aircraft demolished a tail rotor blade on a parked helo and went on to inflict limited damage to its tail section.

The pilot's judgment was in error not only because he continued on a doubtful course without exercising proper discretion, but also because he chose the wrong lineman to direct him.

TESTIMONIAL 1

The primary cause of an accident in which an SH-3A capsized and sank during water taxi was failure of the No. 1 engine. (Contributing factors were the Intermediate Maintenance Activity's failure to incorporate a power plants change which would have probably prevented the engine failure and the pilot's failure to lighten the helicopter and attempt a single-engine water takeoff.) The pilot's decision to taxi to the seaplane ramp determined the subsequent chain of events. Thirty-five minutes later, the helicopter capsized forward and inverted. All four crewmembers escaped successfully. Rescue by motor whaleboat from a nearby destroyer was almost immediate. Individual narratives of the escape from the sinking helicopter follow:

Pilot: The pilot, who was sitting in the right front seat, states that after the main rotor hit the water and the aircraft inverted, he waited until it settled before starting his escape. Then he unfastened his lap belt and swam aft toward the light. He took a few breaths of air from an air pocket in the sonar compartment, then exited without difficulty via the crewmen's escape window. As he went through the opening he observed that the window was no longer in the airframe. Just before he approached the surface he inflated one of the CO_2 cartridges in his life vest. Immediately the destroyer motor whaleboat came alongside and picked him up.

Copilot: At the time of the accident the copilot was sitting in the left front seat. His side window was fully open because the cockpit had been a bit warm for him. (He was wearing the inner liner of his anti-exposure suit.) The aircraft seemed to roll over to the right side. When motion stopped, he reached for his lap belt release as the water covered him. On his first attempt he missed but he caught it on the second try.

The copilot judges that he must have been three to four feet beneath the surface of the water when he went straight out the window without difficulty. He was the first to reach the surface. He carried his life raft out with him but did not inflate it. Although he inflated only the right CO_2 compartment of his life vest, it seemed to give him enough flotation at first. As his flight gear became waterlogged, however, staying afloat became more difficult. He states in retrospect that inflation of one compartment does not provide sufficient support.

Shortly after this the helo capsized and sank.

1st aircrewman: When the helicopter inverted, the first aircrewman was standing behind the copilot's seat where because the ICS was no longer functioning, he had been getting some instructions from the pilot. The aircraft immediately filled with water after it flipped over. He tried to open the escape hatch on the personnel door, encountered difficulty, and then tried the lower part of the personnel door. This opened and he escaped through it. After swimming to the surface he pulled the toggles on his life vest. Both sides inflated, providing excellent support. He estimates that 30 seconds elapsed from the time the aircraft inverted until he reached the surface. When he surfaced, he saw the two pilots and the other crewman and realized that all occupants were safely out of the aircraft.

L TO TRAINING

2nd aircrewman: The second aircrewman had unstrapped to help the first aircrewman seat the sonar dome of the helo. He had remained unstrapped on the edge of the left crewman's seat to facilitate communication with the pilots since, as stated above, the ICS was no longer functioning. He was holding on to the harness strap of the fifth seat because he was feeling seasick. When somebody yelled, "we're flipping!" he grabbed hold of the fifth seat and tried to prepare himself.

Events took place so rapidly that he doesn't know how he got from the crewman's seat to the personnel door. He tried unsuccessfully to open the top half of the personnel door with the emergency release handle. Air still remained in the cabin at this time. He thought that the door would not open until the cabin completely filled with water but he kept trying. When he found what he thought was the last bit of air, he took a breath and tried again unsuccessfully, this time with the cabin full of water.

At this point he lost hope but tried once more with all his strength. The door finally gave. After exiting, he felt his way along the strut and the sponson. While inside the aircraft he had imagined that it was sinking and that he would have 20′ to go to the surface. However, he reached the surface as soon as he went past the sponson. Pulling the toggles on his life vest momentarily gave him trouble because of his wet gloves but he inflated it successfully. Minutes later he was picked up by the motor whaleboat.

Survival Training

The copilot's statement on survival training is of considerable interest: "The two most outstanding examples of previous experience I have had with underwater escape were Preflight and RAG training at HS-10. In Preflight we had Dilbert Dunker training, of course. We were put in almost the same position—inverted and strapped in. This escape was just like that one only easier, I think.

"When you check into HS-10 for RAG training, you go through what I thought at the time was a Mickey Mouse escape, blindfolded from the copilot's seat. You pull the emergency release handle and roll out of the window onto a mattress. It was funny at the time, but that outstanding training prepared me for this escape.

"I knew exactly where the window and emergency handle were and though I did not use the emergency handle, I never got disoriented because I had my left hand on the window frame. The exit out the fully open window was easily made with no entanglement of seat life raft pack or mae west. Once I reached the surface, I inflated only one side of my mae west. At the time I rode pretty high in the water but just before they pulled me aboard the small launch I was getting pretty waterlogged. I should have blown both CO_2 bottles."

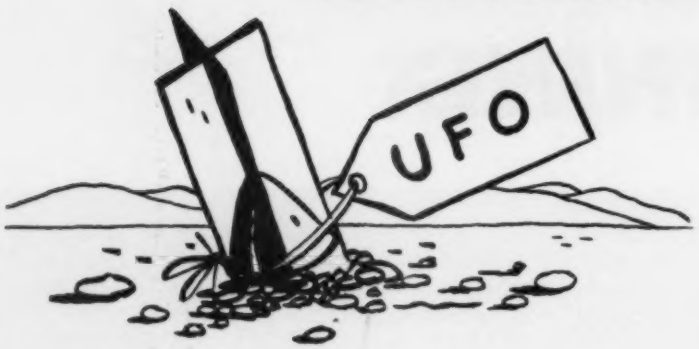
"It is worthy of note," the investigating flight surgeon wrote, "that almost all routine safety and survival procedures were followed by all occupants of the aircraft. Emergency ditching procedures were verbally reviewed by the pilot prior to flight. All occupants were in possession of all items of required flight gear and survival equipment, including individual life rafts. The equipment was properly used and functioned adequately in all cases.

"Three individuals noted that the slipperiness of wet flight gloves hindered them slightly in pulling the toggles of their life vests but there were no other complaints. Each of the aircrewmen should have had lap belt and shoulder harness fastened but both were unstrapped to facilitate communication after the aircraft's ICS failed to function. The crewmen are of the opinion that this did not constitute a hazard to them when the aircraft inverted.

"Both crewmen experienced initial difficulty in opening the escape hatch on the personnel door. It is felt this occurred because of the differential in water pressure while the aircraft was filling with water and not the malfunction of the escape hatch."

Among the recommendations in the aircraft accident report was that "after a water landing, all emergency escape hatches should be jettisoned making six exits immediately available should it become necessary to abandon the aircraft."

Whose Bomb?



Three A-4 aircraft were conducting over-the-shoulder bombing maneuvers with Mk-76 practice bombs. One *Skyhawk* released six bombs, five were "spots" and one was a "no spot." The second aircraft got six out of six "spots." The third A-4 got only one "spot" out of five releases.

Soon after returning to home base, a report arrived concerning the "no spot" drops. An industrial plant several miles from the target was annoyed because three of the practice bombs had struck their property. Subsequent investigation revealed that should the angle-select-switch on the aircraft's LABS gear be improperly set in the LOFT position, vice an O/S position, bomb strikes could be slung off target. The distance coincided with the target-to-industrial plant differential.

The pilot who dropped the four "no spots" stated that to the best of his knowledge his switches were correctly set, and maintenance checks indicated that all were in proper working order. It is significant that his one "hit" was on his second run. This would mean that if the off-target impacts were a result of his mismanagement, then he would have had to change switch positions for his "no spot" runs. This would entail several switch changes between runs which he said he did not do.

The actual culprits were never definitely fixed. The end result is a strong recommendation that all pilots be constantly cautioned to use check lists for ordnance missions in the same manner as they use normal checkoff lists.

Frozen Slats

My leader and I were flying A-4-Cs on an extended cross-country hop. One leg required an IFR clearance. Approaching the destination we had been in and out of clouds. Approach Control brought us down to 16,000′ where we could see the ground just below the high overcast. We were then split up for individual approaches.

While my leader made his descent, I was put into a holding pattern at 14,000′. This put me back in some clouds and immediately rime ice began to build up on my wing leading edges. After about five minutes of this ice build-up, I was about to request a change of altitude when Approach Control cleared me to descend.

At 6000′ I broke clear of the clouds. I was cleared to 1200′ so I performed the landing checks. Rate of descent was 700 FPM and upon decelerating to 150 kts, my port slat started to extend but the starboard one did not move. In an instant I was in an uncontrollable, very rapid roll to starboard. A quick glance in my mirrors showed the left slat fully extended and the right one still flush. Full left rudder and aileron did not stop the roll so I tried violent cross control movements. Then I became inverted at that low level, still 1200′, full power seemed the next best alternative. This did the trick because as speed built up, the left slat retracted and I was able to right the airplane.

Caution was now the word as I again slowed down constantly kicking rudder and slapping the stick. Success was mine as both slats came out almost simultaneously. I made a normal but nervous landing and upon touchdown both slats retracted and froze in the closed position.

As a result of this incident I recommend A-4 drivers be wary of icing conditions. Uneven slat extensions can cause control problems.

ANYMOUSE

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. As the name indicates these reports need not be signed. Forms for writing Anymouse Reports and mailing envelopes are available in readyrooms and line shacks. All reports are considered for appropriate action.

— REPORT AN INCIDENT, PREVENT AN ACCIDENT —

Complacency Kills

It had been a long day, starting at 0800. I had launched from NAS Nowhere in my trusty *Skyhawk* for two CQ traps aboard USS FOULDECK. We orbited for an hour, grabbed two traps and bingoed to NAS Fighterbase. We refueled and returned home without incident.

At about 2045 we manned our birds again for a 2200 overhead. Enroute to the boat, I noticed the elevator control was unusually stiff, but with the aid of trim had no problem controlling the bird. As usual, the *Crusaders* ahead of us were spending an excessive amount of time in the bolter pattern, so we sat at marshall on the gages for an hour and a half waiting for a ready deck. Finally, we were cleared to descend and found a low overcast, low visibility pattern. More actual instrument time. I felt unusually comfortable on the glide slope and quickly made my two traps. After being fueled on deck, I was launched for home base VFR.

About 0030, while letting down to home base, I remember noting that my radar altimeter was out; I was very tired, I needed a new altimeter setting, MLP was in progress. I would have to land on the right runway, right-hand pattern; the A-4 cockpit was designed by a sadist, and I was glad to be home. When I called for landing, the tower informed me that the right runway was fouled and cleared me into the MLP pattern on the left for a final. My interval on downwind was close, so I started to ease to the outside when the tower called me for being low. My altimeter showed me 200′ low in the 450′ pattern. No sweat. I added power and rotated slightly to climb. I glanced out of the side of the cockpit and could see the ground very plainly illuminated *by my wing lights!*

While climbing, I call for an altimeter setting and discovered that my indication was 210′ off. I had been clearing the ground by less than 50′. All I could think of was the safety poster that I walk by every day that says *COMPLACENCY KILLS.*

A Near-Miss on Night GCA Roll Out

Having filed a DD-175 for this scheduled night round-robin (a chance for some night time at altitude). I took off at approximately 15 minutes past official sunset in an F-8. The flight proceeded normally until about half way through the route. At this time, center instructed me to switch frequencies. Having completed the frequency change I was unable to raise center although I could hear them loud and clear. A fast check of previous and preset frequencies convinced me that I did indeed have a transmitter failure. After 15 to 20 minutes center had determined that I was receiving only by having me squawk different codes.

Hand-off to approach control was normal although I still could not talk to them. Approach started me down on a tacan penetration and picked me up on a PAR approach to a 12,000′ center-lighted runway. Everything went smoothly and normally until on final approach approximately 6 miles out at which time the controller informed me that there was an aircraft on short final. Clearance to land came 2 to 3 miles out.

I remember looking down the centerline lights and seeing a seemingly clear runway ahead. I had been VFR since 4000′ in the penetration. Touchdown was on speed and I made no attempt to slow down in a hurry, intending to take the entire 12,000′ for roll out. The first indication I had that anything was wrong was when I flashed by an F-4. It was my impression that I passed within 25 to 50′ of the aircraft and it was just turning off the runway and was not yet clear. This occurred with 4000′ of runway remaining.

Upon talking to the tower personnel later it was their feeling that there was plenty of clearance, but I still contend that no aircraft should turn off early at night, especially with a malfunctioning aircraft landing behind. It is also the responsibility of the pilot who is landing in front of such an aircraft to keep rolling to avoid such mishaps.

The F-4 in this case had been told that he had a NORAD landing behind him. He was put in this situation through circumstances beyond his control, but still, a little consideration for the other guy's problems, not to mention creating one for himself, would have gone a long way.

Night vision doesn't leave any room for mistakes even in VFR conditions. Those centerline lights really help out the night landings. It's too bad every Navy field can not be equipped with them. Every little bit helps at night.

Reader Questions Headmouse Answers

Have you a question? Send it to Headmouse, U. S. Naval Aviation Safety Center, Norfolk, Virginia 23511. He'll do his best to get you and other readers the answer.

Let There Be Light

Dear Headmouse:

We have come across a problem area that could well be throughout naval aviation although not recognized as such.

Allowance lists do not carry a light with sufficient candle power for jet engine inspection. For years operators have borrowed the Navy Airborne Signaling (Aldis) Lamp. It served the purpose well provided a 24-volt battery, cart and proper connectors were available. It generated quite a bit of heat but this was ignored because the Aldis *was* the best available. Today, the 24-volt battery and the Aldis lamp is very scarce on jet bases.

In seeking a solution to this problem we found the light in the A-4 Fuel Tank Inspection Kit met all the criteria for detailed inspection of engines and fuel cells. The light operates on 110 volts a.c. which is available from hangar power or NC-5 generators. A transformer rectifier in the light cord drops the power to 12 volts d.c. to operate a cool, high intensity, sealed beam lamp that is safe inside fuel cells. It puts out a tremendous light for locating pin holes in fuel cells, cracks in jet engine blades, etc.

After two years of usage by every squadron here the light has failed. The problem now is to get a replacement. It is part of a very expensive kit and is not available otherwise from the supply system.

We would appreciate any information on how others have solved the problem.

ADCS R. P. JUNKER
VC-7 POWER PLANTS
NAS MIRAMAR, CALIF. 92145

▶ Your letter concerning the use of the A-4 Fuel Tank Inspection Light for jet engine inspection has stimulated considerable interest among power plants people in various fleet units.

Indications are that none of these people have used the A-4 light, but have been using either the Aldis Lamp or flashlights. Although the boroscope is the support equipment item intended for this purpose, all agree that it is inadequate. Since your letter indicates the A-4 light is the best available, is highly satisfactory and has a high degree of reliability, the word is passed along.

Here are some pertinent relative points:

Light Jet Inspection, Parts list No. 2127, Source Code P1, Mfr's Code 81920 is manufactured by Burton Manufacturing Company, Van Nuys, California. Ref: NavWeps 01-40AVA-4-9, Fig, 9-2A, Item 69A-10.

It is part of the A-4 Fuel Tank Inspection Kit 2RX 4920 820 2774 SDGA costing $2050. Allowance: 1 kit per A-4 squadron. It came into being in 1961.

Cost of the light alone is estimated at $15 to $20 by ASO, Philadelphia, and they confirm the light cannot be procured separately at present through Supply sources. It is suggested that replacement lights be open-purchased direct from the manufacturer.

Boroscope, Mod S623, FSN RX 4920 874 7492 S231; Allowance, 1 per squadron; cost per unit $95. In view of your experience and the economics of solving this problem, it is suggested that your command initiate a letter of justification, together with a recommendation to NavSysComRepPac that the A-4 light be made available as a separate item for fleetwide use.

Very resp'y,

Headmouse

Drag Chute Techniques

Dear Headmouse:

Reference your "No Chute" article in APPROACH, August 1966 (p. 16). This article discusses a no-chute landing in an F-4 with another F-4 on the runway. The pilot was criticized for not waving off with a drag chute failure.

Our A-3 squadron uses the following procedures which relate to the above mentioned problems: (1) Every landing is a possible no-chute landing. (2) A waveoff is never attempted once the chute is deployed, whether it is effective or not. (3) No landing is attempted until the lead aircraft is safely stopped and no overrun is possible.

Under our rules, the main error of

the F-4 pilot was landing too close behind the plane ahead of him.

SQUADRON SAFETY OFFICER

▶ Your squadron landing rules seem pretty sound for modern jet tactical aircraft. It is often necessary to tailor such rules to the model aircraft assigned to each particular squadron. Influential factors will be weather, type airport used, emergency arresting gear available, type of operations (possibly combat) and degree of pilot proficiency.

Very resp'y,

Headmouse

Another Near-Miss

Dear Headmouse:

We were conducting initial CQs. The weather was marginal VFR. The CCA was out of order, so we were advised that all flight operations must be conducted visually. Once airborne, pilots reported to the carrier that the weather was deteriorating and the answer received was "this is an all-weather ship." In other words, literally interpreted-continue initial CQs.

CQs did continue and a waveoff aircraft nearly collided with another one on the downwind. Near miss distance was estimated at about 15'. By that time, airborne pilots estimated that the weather had truly become IFR. Operations were summarily secured without further incidents or accidents.

ANTI-COLLISION MOUSE

▶ Initial CQs should be conducted in favorable VFR weather. Signs of weather deteriorating to IFR should be quickly recognized in order to be extra safe with new pilots. The NATOPS manual for LSOs states that weather for day CQs must be at least 700' ceiling and 5 miles visibility.

Very resp'y,

Headmouse

Check and Double-Check

Dear Headmouse:

I had just finished having a HVAR plug-in at the arming area. Assuming everything okay and the check list completed, I started taxiing for takeoff. Immediately upon moving, I was told by the copilot to hold. Immediately thereafter, the loading crew chief emerged from the nose wheel well—shaken but uninjured.

This could have definitely been a serious accident and could have been prevented by correct use of the loading check list. The list states that everything is finished when the loading chief gives the pilot(s) the double thumbsup.

We did not wait and almost lost a good ordnanceman. Needless to say, I owe him a case of beer—at least.

SHOOKMOUSE

▶ We hope all our readers will be re-reminded that naval aviation is a team of many people. A breakdown or a shortcut of established procedures is the usual cause of many incidents. NavAirSysCom manuals delineate safety procedures for each model aircraft and every piece of ordnance. On top of this, most commands issue refinements to the standard safety instructions as indicated by local peculiarities. The rules may be tedious, but they make the system work—safely!

Very resp'y,

Headmouse

More On Hip Shot

The March 1967 issue of APPROACH carried a Headmouse item titled Hip Shot. In the last paragraph of the answer it was stated ". . . side arms can be carried safety if the chamber under the hammer is left empty. . ." Headmouse has received several long letters all boiling down to the fact that no safety is gained by leaving the chamber under the hammer empty; because a hammer block will prevent the hammer from striking the bullet unless the trigger is pulled all the way back, revolving the cylinder to the next round in line. This is basically correct if the revolver is the standard type .38 cal. issued to USN/USMC aircrews and it has *not been altered*. Unfortunately, the revolver in question was not "standard" issue and it *did discharge accidentally*. History is full of people having been killed by guns inadvertently fired.

Concerning the gun in question, for example, we do not know if the hammer hit the bullet below it, or if the trigger was snagged and pulled. If the hammer slipped and went forward somehow, an empty chamber would have saved the day. On the other hand if the trigger or hammer were accidently pulled, then the chamber under the hammer would have moved and the *next bullet in line* would have been the culprit—and then our gun experts are right—but who knows? The report did not contain any details about the gun or answer such questions as; was an investigation conducted to find out why it misfired? Or was the gun altered by its owner?

The combat squadron ASO who wrote the report says ". . . leave the cylinder empty *next* to the firing pin." The cylinder *next* to the firing pin is the one directly under it. But perhaps he meant the cylinder which would *revolve next into position* if the trigger were normally pulled. One sure way to prevent an accidental discharge would be to leave two chambers empty, the one under the hammer and the one *next in line*. But then this leaves only four useful bullets. The experts already deplore the thought of only five bullets so they surely will howl if reduced to four.

One writer took us to task over calling the Magnum a pistol. In the language of gun experts, he is correct, it is a revolver. When the revolver came into common usage in the last century, it was adapted from the single shot pistol. As time has passed it has become known by one word, revolver; while the title, pistol, has remained with the single shot and clip loaded automatic pistols. It is not uncommon for all handheld guns to be referred to as pistols, in that the word, revolver, by itself, seems to be incomplete.

The end result of all this discussion will be up to the individual command and combat aircrews. They will load their side arms to suit personal views on usefulness and safety.

Thanks to: Capt. Saxe P. Gantz, USN; Ledr L. A. Clement, USN; Ledr. D. E. Barck, and Revolver Mouse who at press time had written to us on this subject.

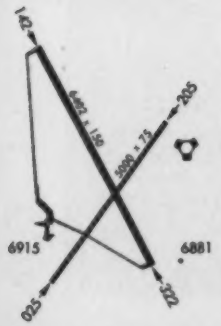
Editor

Beginning with this issue a new monthly feature

ON THE GLIDE SLOPE

The primary mission of VA-127 is to provide basic and refresher all-weather jet instrument training for fleet replacement pilots. In the course of their training many questions are raised concerning instrument techniques, instrument flight rules and their application to special situations.

Do you have a question concerning any phase of instrument flying for which you cannot find a satisfactory answer? If so, send it to APPROACH or mail it directly to the Commanding Officer VA-127, NAS Lemoore, Calif. 93245, and let the experts research it for you.



1. Question: When a holding fix is different from an approach fix, for example, Travis AFB Tacan/ILS RWY 21L-2, do you leave the holding fix at the expected approach time or depart the holding fix to arrive at the initial approach fix at the expected approach time? This question is predicated upon a lost communication situation.

Answer: Flight Information Publication, Section II, Paragraph III.

a. If an expected approach time has been received, leave the holding fix in order to arrive over the initial approach fix as close as possible to the EAC time or ETA if no EAC has been received; commence descent at the IAF, but not before the EAC or ETA time. Descent shall be made in the holding pattern down to the initial approach altitude if different from the last assigned altitude.

b. If a holding clearance has been received and an expected further clearance time, depart the holding fix at the expected further clearance time and descend in holding at the IAF to the initial approach altitude and commence the approach.

2. Question: What procedures are to be exercised on a radar vectored enroute descent to a field and lost communications occur in IFR conditions?

Answer: Flight Information Publication, Section II, Paragraph III.

The pilot will proceed to the initial approach fix/radio facility to be used for the approach at the destination field at the last assigned altitude or minimum safe altitude, whichever is higher, and from that altitude execute the published penetration in lieu of climbing to the initial approach altitude. The

minimum safe altitude is understood to be the minimum safe altitude listed on the published approach if the entire approach lies within this 25 NM circle, or the emergency safe altitude if any part of the approach is outside the minimum safe altitude circle. If there is any doubt as to where the IAF is located with respect to this 25 NM circle, climb to the emergency safe altitude.

3. Question: A naval aviator, standard instrument card, desired to file an IFR flight plan, utilizing a tacan-only single-piloted aircraft. The departure airfield is listed as a "P" field in the IFR Enroute Supplement, with only a VOR low altitude instrument approach procedure available (minimums 400/1). May this aviator file an instrument flight plan and if so, what are the departure weather minimums?

Answer: The pilot may file an IFR flight plan from the field in question, through the nearest FAA Flight Service Station, provided no military operations office is located on the field. ATC clearance must be obtained prior to takeoff and the weather minimums applicable are 300′ ceiling and 1 mile visibility.

OpNavInst 3710.7C Part 561—IFR Enroute Supplement.

The procedures section of the IFR Enroute Supplement outlines the applicable procedures required for flights departing "P" fields. If IFR within a control zone or area, ARTC clearance must be obtained prior to takeoff.

Part 562 of OpNavInst 3710.7C states that takeoff weather minimums for a standard instrument rated pilot are 300′ ceiling and 1 mile visibility, unless PAR is available. No mention is made of the type of approach available, other than PAR. FAR 91 Paragraph 91.117 states in brief that the published takeoff minimums for civil aerodromes are applicable only to air carriers and commercial operators of large aircraft, foreign air carriers and air taxi operators of small aircraft.

NATOPS
EMERGENCY PROCEDURES
Pay Off!

NATOPS Emergency Procedures are the product of the most knowledgeable people in their field and of many man years of experience. Aircrews are required to be intimately familiar with these instructions. The details are not written to frighten people about what might happen but to assist them when difficulties occur. Pilots and crewmen not only have an obligation to preserve their lives but also to save government property (the airplane) if it is at all possible. Moreover, no one wants to be responsible for a crash which damages property or causes casualties to innocent bystanders.

Their performance during a recent accident serves as a good illustration of a pilot and aircrew who were fully aware of these responsibilities. The SP-2E was level at 7000′ on an IFR flight plan. Enroute to their first stop the port reciprocating engine began to backfire moderately. Power was reduced to 30 in. Hg., the mixtures were set to RICH and the spark RETARDED. The port jet was started and alcohol deicer fluid applied for 20 seconds.

The altered power settings seemed to stop the backfiring but the engine analyzer indicated that numbers 1 and 2 cylinders were not firing on the right magneto. The pilot opened the throttle slightly and the engine backfired again. A small amount of oil was then observed to be coming from the upper inboard cowl flap. At the same time smoke began to stream from the underside of the nacelle.

The pilot wasted no time in shutting down the engine and feathering the propeller. Fuel, oil and hydraulics were also shut off and the cowl flaps were closed. A close visual inspection revealed no trace of fire and the smoke stream stopped shortly thereafter. The chip detector light illuminated after the engine was shut down.

Feeling that the emergency was under control, the plane commander elected to continue to destination. He set the port jet at 88 percent, the starboard recip at 2250 rpm, 174 BMEP, mixture RICH and the spark RETARD. Bravo Center (their current IFR controller) was informed of the situation and the pilot requested a descent to 5000′ in order to build up some airspeed. Descent was granted, but only to

Burning fuel charred the grass . . .

. . . The crew got out just in time . . .

. . . Fire consumed the *Neptune*.

6000′ and the pilot was directed to change over to Charlie Center.

About 10 minutes after making contact with Charlie Center, a passenger located in the afterstation notified the crew that smoke was again coming from the port reciprocating engine nacelle. A crewman in the radio compartment confirmed it.

The pilot quickly declared an emergency with Charlie Center. The controller responded with the location of the nearest airport suitable for an emergency landing. Meanwhile, all hands were directed to prepare for possible bailout.

In a very few minutes the fire had become so intense that smoke began to filter through the wing beam and into the fuselage. Charlie Center was informed that unless an immediate landing could be made, the crew would have to bail out. Center replied immediately that a small airport with a 3300′ paved strip was directly below the aircraft.

All hands took their ditching stations and a 250 kt emergency VFR descent was commenced. The cowl flaps on the burning engine were opened in an attempt to blow the fire out. Unfortunately, this act only increased the intensity of the fire. The cowl flaps were again closed and all efforts turned towards making the field. Just prior to touchdown the port engine fire warning light illuminated.

The wheels touched 500′ down the runway at 125—130 kts. The copilot secured the jets, both pilots got on the brakes and the good starboard recip was placed in reverse. Asymmetrical reverse thrust caused the aircraft to veer off the right side of the runway, but efficient use of nose wheel steering and brakes reestablished a straight course on a hardpacked grass area bordering the runway.

The *Neptune* was brought to a safe halt 500′ off the end of the paved strip and the passengers and crew all exited the aircraft safely.

Within two minutes the airport's fire truck (a jeep) arrived, but the crew reported that its foam equipment was inoperative. By this time the entire port engine had become engulfed in flames. Consequently, the plane commander, fearing a gasoline explosion, directed that everyone get comfortably clear. The civilian firemen were not equipped with protective clothing so they too were held back.

With no foam available to deter it, the fire quickly engulfed the wing, ruptured the fuel tanks and completely consumed the entire aircraft.

Investigation later determined that the trouble began with the failure of an exhaust valve in the number 2 cylinder. The broken exhaust valve head caused intake valve failure—pieces of which, in turn, punctured an intake pipe and damaged the piston and combustion chamber. A large piece of metal from the cylinder then became wedged in the turbine buckets and caused a sudden seizure of the number 3 power recovery turbine. The PRT broke away from the supercharger rear housing and tore open 6 exhaust pipes.

When the number 2 piston dome broke, oil sprayed out of a large opening in the supercharger rear housing which had been ripped out when the PRT broke away. The residual fuel and oil spray was then ignited by flames from the severed exhaust pipes. Coupled with a fire in the induction system which probably started when the intake valve failed, the blaze built to proportions that quickly became uncontrollable.

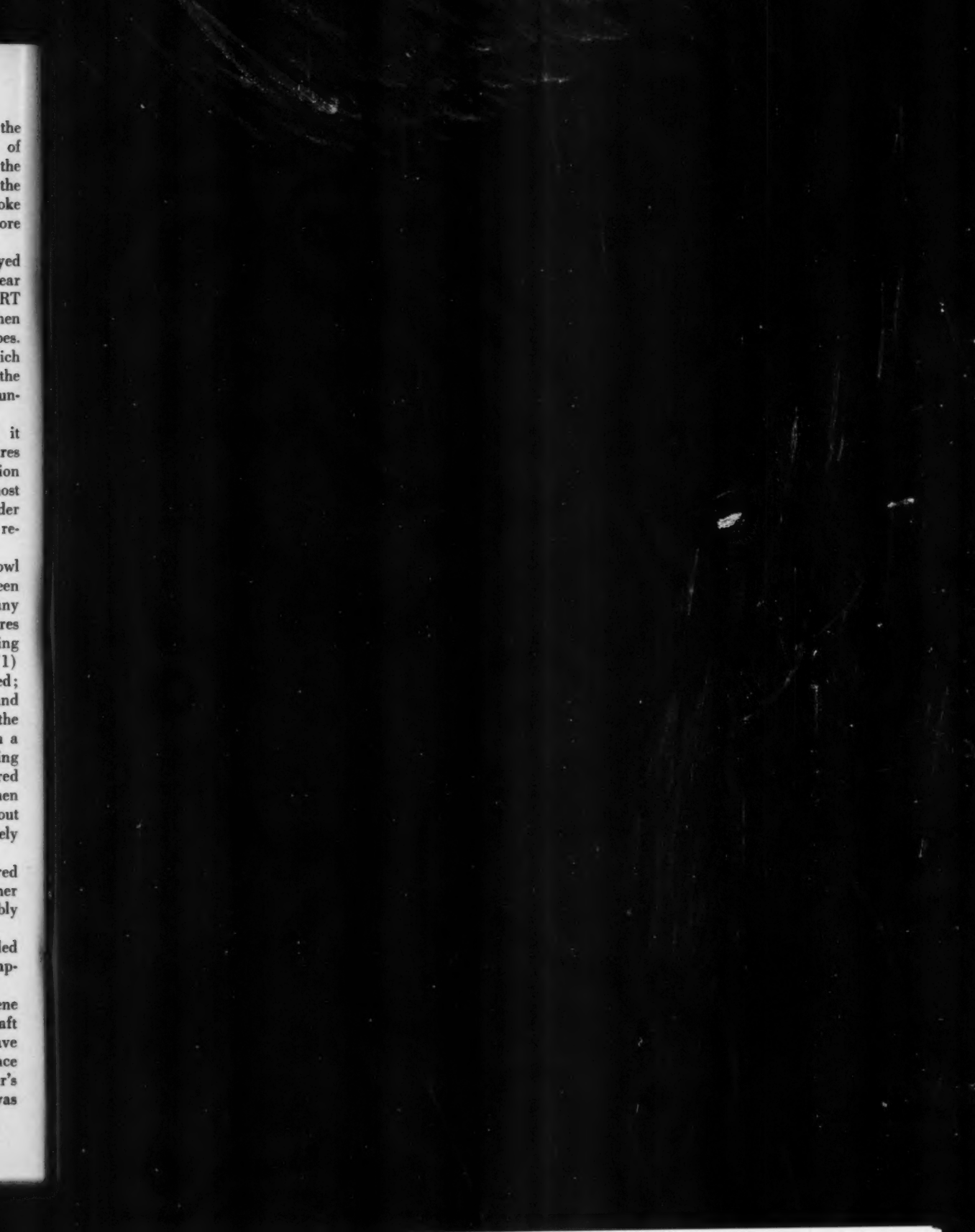
Oil has a high flash point and once ignited, it becomes very difficult to control. The temperatures found in an oil fire such as this intensify combustion to the extent that the fire can burn through almost any part of an aircraft's engines or wings. In order to make the best of such a situation, the pilot's reaction must be swift and proper.

Since the fire increased in intensity after the cowl flaps were opened in flight, some discussion has been raised concerning their proper positioning. The many types and different degrees of inflight engine fires can require entirely different techniques for effecting remedial action. These depend on such factors as: (1) the intensity of the fire when it is first discovered; (2) the source of the material feeding the fire; and (3) its specific location within the engine. After the fuel, oil and hydraulic shutoff valves are closed in a P-2 the sources of fire are greatly reduced. Keeping the cowl flaps CLOSED after the engine was secured and no trace of fire was observed, then OPEN when fire was encountered (in order to help blow out the flames) is considered to have been an entirely prudent procedure in this case.

Lack of an engine fire extinguisher was considered to be a contributing factor. If such an extinguisher had been installed loss of the aircraft would probably not have occurred.

In a recent letter NavAvnSafeCen recommended that NavAirSysCom provide fire extinguishing capabilities in the P-2 aircraft.

If fire-fighting equipment had been at the scene and ready to deliver foam as soon as the aircraft had stopped, the situation might likewise not have gone to the lengths of complete destruction. But since a delay was encountered, the plane commander's decision to hold back the fire-fighting crew was probably responsible for saving their lives.



The Confidence Game

After a tractor ran into it, the starboard outboard wheel well door of a US-2C was removed. No replacement part was immediately available, so the aircraft went AOCP.

In the normal course of maintenance all the other gripes written up on the aircraft were worked off, and it sat out on the line waiting for its replacement wheel well door. Commitments were becoming harder and harder to fill in the detachment and before long, thoughtful minds turned towards the idle bird out on the line.

The acting Ops/NATOPS officer thought back to his training command days and dredged up a memory of having operated S-2s with the wheel well doors removed. He immediately informed the maintenance officer and the Acting Officer in Charge and added another recollection that the only abnormality the pilots would encounter would be an unsafe indication in the cockpit when the wheels were retracted.

Commitments were tight at the time and, no doubt, this information fell on receptive ears. Since the mark of a shrewd manager is to capitalize on opportunities such as this, the detachment's Acting O-in-C set his men to work.

A different crew, as it turned out, was sent out to the aircraft to block off the hydraulic lines and get it ready for flight. The aircraft was then placed in a "ready" status, even though no drop check had been performed on the bird in its new configuration.

When a gunnery tow flight came up on the schedule, maintenance had the perfect airplane to fill the slot. The maintenance officer took time out from cleaning up some paperwork required by his pending detachment to assure the pilots that the only peculiarity they would encounter would be an unsafe gear indication in flight.

The launch went as scheduled and the hop went by uneventfully. But when the time came to land at the end of the period, the pilot found that his starboard main mount would not go down. Not realizing the cause of all his difficulties, he went through the lengthy NATOPS procedures for lowering the wheels but had no success.

The end result was a wheels-up landing into E-27 arresting gear on a foamed runway. Extensive skin damage and two precautionary engine changes resulted. Luckily, there were no injuries.

A cursory look through the HMI by any one of a number of people could have saved the government some money and spared the command a great deal of embarrassment. The handbook clearly lists the sequence of events that occur when the landing gear is cycled. It explicitly states that the wheel well doors operate the landing gear up-locks through push-pull rods and that the last motion of the outboard door in opening releases the main gear from the uplatch. Since the doors were entirely removed in this case and no modifications were made inside the wheel well, there was simply no way to get the gear back down once it had been retracted.

The willingness of everyone involved to accept vocal assurances that the aircraft was safe to fly suggests the attitude displayed by a herd of lemmings hell-bent on self destruction. No one, enlisted or officer alike, doubted that events would not turn out exactly as someone (who should have known better) said they would.

No one was energetic enough to disrupt the flow of events and ask a simple question. No one stopped to consider that the other guy might not know everything there was to know about what he was doing.

The failure of the maintenance department to fully research its work shows a lack of organization, but the reasoning displayed by everyone who had anything to do with releasing the aircraft for flight in its new, untested configuration, shows a lack of common sense.

COMPLICATIONS

Complications developing during the water rescue of a pilot after ejection could have caused the loss of a helicopter.

Things started out as well as could be expected. Ejection was smooth although parachute opening at about 4000′ was rather violent. During a slow and calm descent the pilot had plenty of time to release the left side of his seat pack. When he first hooked up his life raft lanyard it was looped around another piece of gear so he released it and resecured it properly. He then let his PK-2 raft fall free. The sea anchor came loose and circled above his head. He inflated his Mk-3C life preserver just before a very soft water entry and the parachute collapsed within a few seconds. The pilot immediately tried to release his right Koch fitting on his torso harness but was unsuccessful.

"I went for the left fitting and opened it on about the third try," he recalls. "Then I went back to the right but still couldn't open it. I tried to provide tension on it by pulling on the riser with my left hand and releasing the lever with my right hand."

At this point, the pilot became aware of another problem. When he reached to get his sheath knife or shroud cutter which were mounted on the anterior surface of his SV-1 survival vest, he found that at some time during the preceding events, the vest had unzipped placing the two tools in an inaccessible position below and behind his armpits.

By this time the rescue helicopter was almost overhead. The pilot managed to get his stainless steel service issue pocket knife from his anti-G suit pocket and began to cut shroud lines. Seeing the pilot was tangled in the chute and trying to cut himself free, the helo pilot dropped the second crewman into the water. The pilot yelled to the second crewman that he was still attached to the right riser of the parachute and pointed toward the release fitting. Because of the noise from the helicopter hovering directly overhead, the second crewman did not hear him and failed to realize the riser was still attached. Despite efforts by the pilot to point out his attached right riser, the crewman put the pilot into the sling and began cutting shroud lines.

"There is some confusion and possible contradiction at this point," the investigating flight surgeon reports. "Apparently the crewman did not hear or realize that the pilot was still attached to his parachute. On the other hand the pilot was under the impression he was being lifted so as to make freeing him a bit easier. Not realizing the true situation, the helo pilot hoisted the downed aviator into the helicopter."

When it became evident that the parachute was still attached, the helo pilot ordered the first crewman who was operating the hoist to attempt to "pull it in" and the pilot and second crewman were brought up. As soon as the canopy began to clear the water, it began to billow. As the pilot was brought inside the helicopter, the parachute almost pulled him back again.

Fearing this might foul his rotor, the helo pilot sent his second crewman back down to attempt to free the fouled lines. This crewman was having questionable success releasing the parachute from the aircraft's underside where it was entangled. The parachute started to pull the helo backwards resulting in a decay of rotor RPM. In an attempt to regain power, the pilot moved off the hover and began dumping fuel. Under control again he returned to a very low hover. At this

point the first crewman cut the parachute riser some 12 to 14" above the Koch fitting.

"This procedure, the proper one to begin with, incidentally," the flight surgeon says, "dropped the chute and shroud lines free and solved the entire problem."

This was only the second rescue as plane commander for the helo pilot and the first rescue for both crewmen.

"In this rescue," the Board states, "the pilot deviated from the normal rescue procedure by lifting the survivor out of the water with the parachute still attached. This resulted in another near disaster. While it is recognized that speed is essential in any at-sea rescue, the board felt that the rescue crew of a plane guard helicopter must make an early decision as to how rapid and how extreme their efforts must be. In the case of the pilot survivor, the haste in hoisting him aboard the helo could have proved disastrous. The crew members must ensure that the pilot is free of the chute prior to hoisting him aboard unless it is apparent they must bring chute and all aboard to save the pilot's life."

The Board's recommendations include:

- That water survival training be made available for carrier pilots and crew, such training to include parachute abandonment and helo pick up procedures.
- That deployed helicopter rescue crews be provided the opportunity to practice open sea helo pick-ups.
- That a suitable means of communication be developed for the helo pilot and his crewman in the water.

The first endorser amplified the board's first recommendation: "The Board recommendation is meant to imply training under more realistic conditions than are available in swimming pool-type training. Full flight gear water entry, separation from risers, use of flotation equipment and actual helo pick-up should be practiced for pilot and helo crew training."

Deep water training for all his pilots and aircrewmen was scheduled to commence in a few months, the fourth endorser noted at the time of the aircraft accident report. To be included was parachute descent (para-sail) to a water entry followed by parachute divestment and helo pick-up.

"All helicopter rescue crews are qualified in open sea rescue techniques prior to detachment deployment," he wrote. "Additional training in this operation is scheduled at the discretion of the detachment officer-in-charge during the deployed phase."

"That the rescue was accomplished with dispatch and zeal is apparent," the report says. "That it almost ended in disaster is significant. The board feels that continued training in the use of the rescue vehicle, the helicopter, is necessary for both the rescuer and the survivor."

Editor's Note: The survival difficulties of an RF-8G pilot who ejected when his fuel state reached zero were, he said, "directly related to the fact that it was dark." Without going into the various elements which combined to produce the situation resulting in the loss of this aircraft after unsuccessful attempts to land aboard ship and to refuel in the air, here is the pilot's survival story.

Out of the Night

"As the aircraft started to decelerate and move aft, I lowered the nose slightly and told the tanker that I was ejecting. The ejection occurred in a wings level attitude at 190 kts and 8000'. The face curtain was used to actuate the seat. I made no special effort to sit erect. I simply turned my head to look forward and pulled the face curtain while in a normal seated position. The seat was raised so I could see better while making carrier approaches.

"No pain or violent shock was felt during the ejection. The sensation was very similar to that experienced with the ejection trainer. The sequencing of the seat could be felt. The drag chute opened. Realizing the chute was open, I dropped the face curtain and momentarily had difficulty orienting myself due to darkness. I did not see my aircraft after I ejected.

"Once I had oriented myself I noticed oxygen flowing into my face mask. I removed the mask and dropped it away, inflated the Mk-3C life preserver, turned on the strobe light and removed my flight gloves. The strobe light was particularly comforting in that it gave my position to the aircraft that were with me and enabled them to track me on my descent to the water.

"My thoughts then turned to what I would do upon entering the water. This is when I deployed the hard pan seat pack. It was quite evident that the pack had worked properly because I could feel the jerk on the lanyard and hear the raft inflate. I then turned my attention to locating the Koch fittings. I found them about a foot-and-a-half above my shoulders and put my hands on them to remember their locations in this new position. I then went over in my mind the release procedures I would use upon entry into the water.

"The parachute descent seemed to take a long time and I had plenty of time to look around. Visibility was good. I could see scattered clouds in the area; however, I could not see the water. The horizon was difficult to see and I was unable to estimate my altitude. Several times during my descent the chute got into moderate oscillations; I made no attempt to stop these due to the lack of visual references.

"With the Mk-3C already inflated, I didn't seem to sink below the surface at all as I entered the water although I'm sure I must have gone under a couple of feet. Realizing I was now in the water, I reached for the Koch fittings to release the chute which was dragging me on my back. I was dragged for about 10 yards before I came to a stop. At this time I thought that I had released the Koch fittings, causing me to stop. (Later I discovered that I had not released the fittings and that I had come to a stop because the chute had collapsed.) I found myself now becoming entangled in shroud lines. At this point I discovered that the right Koch fitting was still connected. I tried again briefly to release the fitting but had no success. Darkness and the entanglement of shroud lines made this difficult. (*The investigating flight surgeon attributed the pilot's difficulty with the Koch fittings to faulty knowledge of their operation.—Ed.*)

"I swam to the lanyard which I could easily see in the water whenever the strobe light flashed, then pulled the raft to me. Holding on to the raft, I spent some time removing shroud lines from around my legs and released the left side of the seat pack before attempting to board the raft. I made several

attempts to board the raft before I actually got aboard. My boarding difficulty was the result of the inflated Mk-3C, the wind, the shroud lines, and the seat pan attached to the right lap belt fitting of my torso harness. I did not want to release the seat pan because it was connected to me by the lanyard on the raft.

"The successful boarding was made head first by pulling the raft under the Mk-3C. I ended up face down. After rolling over to a seated position, I began to look for my pencil flares to signal to the circling aircraft that I had made it to the water and was alive. With the Mk-3C inflated, getting to the flares and shroud cutter on my survival vest was quite difficult. Darkness added to this difficulty.

"After firing one flare I began cutting shroud lines which were still tangled about my legs and shoulders. *I then discovered that both Koch fittings were still fastened to my harness.* It took about a minute of groping in the dark to release the fittings. I then released the right side of the seat pan and cut a few of the remaining shroud lines. At last I was free from the chute. The radio pack and survival kit were hanging from the raft on their lanyards. I tried several times to pull the survival equipment aboard but couldn't because of excess weight. I think the seat pack was still tangled in shroud lines. I decided to wait until daylight before pulling the pack aboard. This would enable me to see what was causing the problem.

"At least one aircraft was circling overhead at all times, apparently keeping my strobe light in sight. The strobe light operated continuously. I signaled two additional times to the circling aircraft with two pencil flares just to indicate that I was still OK. After about 50 minutes I saw the beacon of a helicopter about five miles away and shot my fourth pencil flare. The helicopter seemed to be coming straight toward me and as it got to within 2 miles, I could see its white floodlights.

"I set off the night end of my day-night flare. As the helicopter pulled in close I could see the horse collar near the water about 15 yards away from my raft. I then got out of the raft and swam to the collar. I had no problem getting into it and was hoisted aboard. It took less than 60 seconds from the time I left my raft until I was aboard the helicopter.

"The difficulties encountered in this survival situation were directly related to the fact that it was dark. I carry a flashlight on a lanyard which hangs from my neck. When I was in the water I looked for this light but it was gone. I have no idea when I lost it. All other equipment worked as designed. My one recommendation is to have a flashlight of some sort attached to the torso harness. It would be a great aid in seeing and using other survival gear."

(Editor's Note: This pilot was fortunate to have retained his strobe light. His situation brings to mind a recommendation from another AAR, to wit, that "to simulate a night survival situation over water, all pilots hang in torso harness in a dark room and learn to locate survival equipment by touch and not sight.")

Hot Seat

IN the early hours of a summer morning, preflight of a *Crusader* for its first test flight after PAR (Progressive Aircraft Rework) was routine. The pilot climbed into the cockpit.

As was his custom, he started strapping in with his right leg garter. His oxygen mask and other gear were still outside the aircraft. After securing the right leg strap, he turned to the left one when suddenly his hands were engulfed in flames. Fire was shooting out from under the seat pan like a blowtorch, burning his hair and eyebrows, and blistering his face. He pulled the emergency harness release and tried to escape but his right leg was still fouled.

"I reached with my left hand through the fire," he recalls. "How I got the garter free I don't know, but it seemed to work real quick."

As his right leg came free, he rolled over the left side of the aircraft and over and over on the ramp to beat out the fire. When he stood up, flames were still shooting out of the cockpit.

The pilot's second-degree burns of the hand and legs and a cut knee hospitalized him for something over a month. At the time of the fire, he was wearing a clean flight suit, torso harness, survival vest and cutaway anti-G suit. The anti-G suit melted but protected him from burns except in the areas which are cut out.

Investigators traced the fire to failure of the reducer valve seat (Firewel PN F1517-3) in the seat pan emergency oxygen bottle. The seat pad and other material in the pack fed the flames. The reducer valve is subjected to deterioration in the presence of a high pressure oxygen environment. Crumbling of the valve seat under the pressure of oxygen can result in ignition. Air Crew System Bulletin 81, issued as a result of this accident, calls for replace-

ment of the valve seat during regular overhaul. Installation of a new valve seat (one manufactured on or after January, 1962) is to be performed at the aircraft's next calendar inspection and at each PAR period thereafter.

Second Degree

WHEN a T-34B crashed and caught fire in a farmer's field after a simulated low altitude emergency, the student pilot lost his hard hat on the aircraft's second contact with the ground. He stated that he had been flying with his helmet chin strap loose. If his helmet had stayed on, his burns of the face and neck would have been very minor instead of second degree, the investigating flight surgeon reported.

Board recommendation: Reemphasize to all instructors and students that safety equipment must be worn in the prescribed manner if such equipment is to be of any protective value.

Presence of Mind

PRESENCE of mind saved a helicopter copilot's life when his head was immobilized in the left overhead section of a submerged UH-34E as he tried to escape.

"The rotor blades stopped almost instantly with water contact," the copilot recalls. "The pilot and I unstrapped and the water was quickly going over my head. Gravity was forcing the pilot to apply pressure on me and I could not move but I tried to push him out the hatch. I was under water, the bubbles blinded my vision and I could not longer feel the pilot. I attempted egress but my head was stuck. . . . I loosened the strap on my hard hat and slipped my head out. By this time the cockpit was full of water and free of bubbles. I saw light through the pilot's hatch and swam to it. When free of the aircraft, I inflated my mae west and floated to the surface."

"It must be kept in mind that the removal of a hard hat while completely submerged and wearing wet flight gloves is no mean feat," the flight surgeon reports.

The aircraft was not recovered. The only object investigators could find in similar aircraft which was capable of causing such a problem was the hook for the headset.

Swimmer's Ear

DURING warm weather most of us take a swim whenever we can. This can lead to ear trouble. Treatment is not such a problem for the earth bound but it can ground you from flying.

When you swim some water always enters each ear canal and remains despite efforts to shake it out. In the presence of water, bacteria in the ear canal can grow rapidly and produce infection. The higher the humidity, the more difficult it is for water in the ear canal to dry out of its own accord. If bacteria grow in large numbers, pain, redness, and swelling with a discharge will develop. This requires a doctor's examination and local application of antibiotics.

If the ear canal is kept dry, however, infection is unlikely. This can be done by placing rubbing alcohol in a medicine dropper bottle and putting five drops in each ear canal after swimming. The alcohol breaks the surface tension, allowing the water to flow out of the ear, and evaporates the remaining moisture. Any excess alcohol which flows onto the external ear can be wiped with a tissue.

This simple measure will help prevent "swimmer's ear" but as a word of caution—it must not be used during an acute infection or severe pain will result.

—Adapted from NARTU, NAF Andrews Safety Council Minutes

Strapless

A HELICOPTER crew chief suffered a concussion when he lost his APH-5 helmet in an emergency ditching and struck his head on a window edge as he tried to escape from the darkened cabin of the sinking aircraft. *His helmet had no chin strap and, apparently, no nape strap either.* (This same crew chief was wearing a life vest which he knew beforehand contained a "bad" CO_2 cartridge, according to the accident report.)

BACSEB 17-58A requires a chin strap on the APH-5 helmet; the requirement for a nape strap is contained in BACSEB 24-58. Compliance with these two requirements is, if we may belabor an obvious point, just good common survival sense.

Good Advice

UNKNOWN forces tore open both lower pockets of a TF-9J pilot's anti-G suit on ejection. (This was "either due to the force of the ejection or by being hung up in the cockpit," the pilot says.) His survival knife which he carried in one of the pockets was lost. Wiser afterwards, he states, "I would advise pilots not to carry needed survival equipment in the anti-G suit pockets lest it be lost upon ejection as mine was."

Microbiological Contamination

By LT J. D. Piccioni, NavAirSysComHqs

Slime in fuel tanks first fouls filters, fuel screens and fuel quantity probes. Without due attention microbial slime can lead to severe corrosion problems in the fuel systems requiring many man-hours over and above routine maintenance.

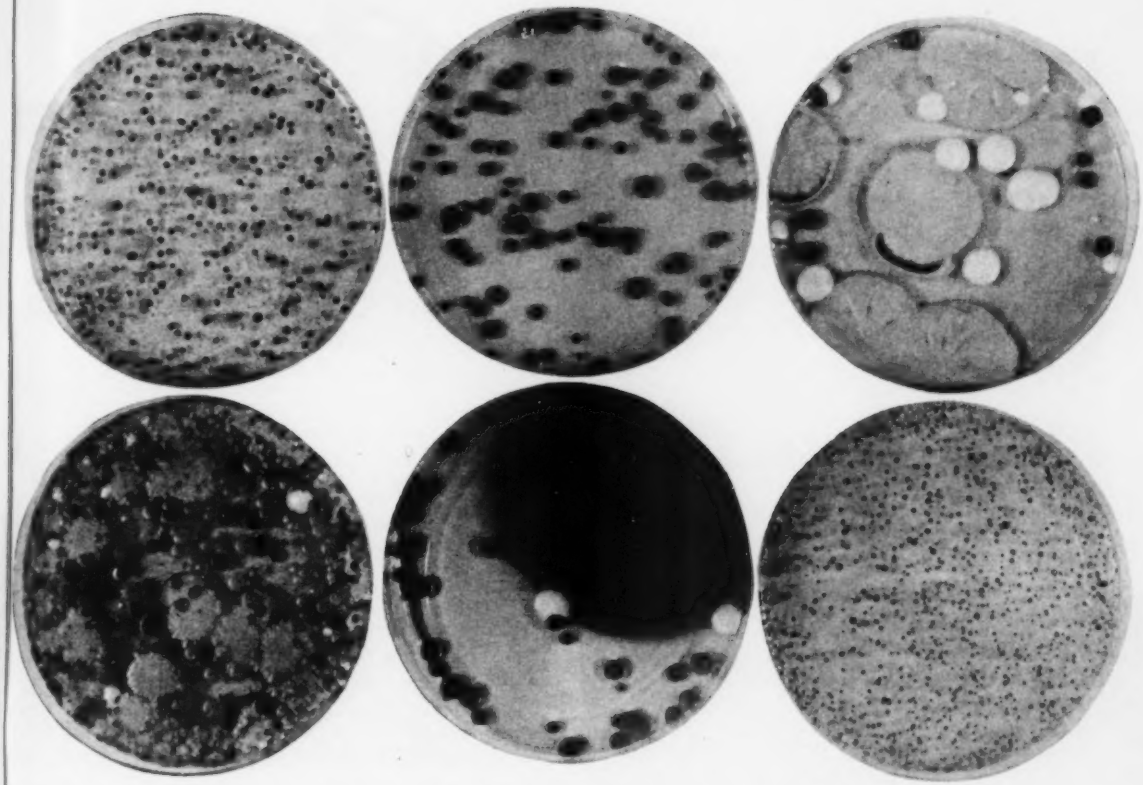
Green slime cultured in sump drain sample.

Microbiological growths in petroleum fuel systems are not a new problem but have been recognized and studied for many years. The advent of jet aircraft operations necessitating a conversion to heavier and more viscous fuels has significantly compounded fuel contamination problems.

Jet aviation fuels, which generally have a high affinity for water as well as other contaminants, play havoc with the small tolerances characteristic of jet engine components. While there are no existing housekeeping practices which will guarantee the *complete* removal of *all* contamination there are, nonetheless, established procedures spelled out in fuel training publications and instructions which provide for keeping aviation fuels within the specification use limits.

Most cases of fuel contamination can ultimately be traced to improperly trained personnel or a failure to adhere to prescribed cleanliness procedures. A brief discussion here of microbiological contamination is meant to update fuel personnel on this particular facet of contamination.

Microbes grow and multiply at the interface between fuel and water layers. Consequently growths are predominantly found at the bottom of storage vessels, filter separator drains, refueler sumps, and similar sites wherever the heavier water element is liable to collect. Although fuel cleaning apparatus such as filter separators are designed to eliminate contaminants, they are still mechanical devices sus-



Cultures of slime growth found at fuel water interface in fuel storage tanks.

ceptible to malfunction and failure. In any case, some water may be permitted to accumulate at low point locations and foster microbiological growth.

Because microbes require water, they are seldom found in the fuel more than a few inches above the water level. They do however, utilize the fuel hydrocarbons and trace minerals as nutrient sources. Microbes generally thrive in the warmer climate and high humidity conditions common to the tropical/subtropical area of operation and prefer large surface areas of water and fuel.

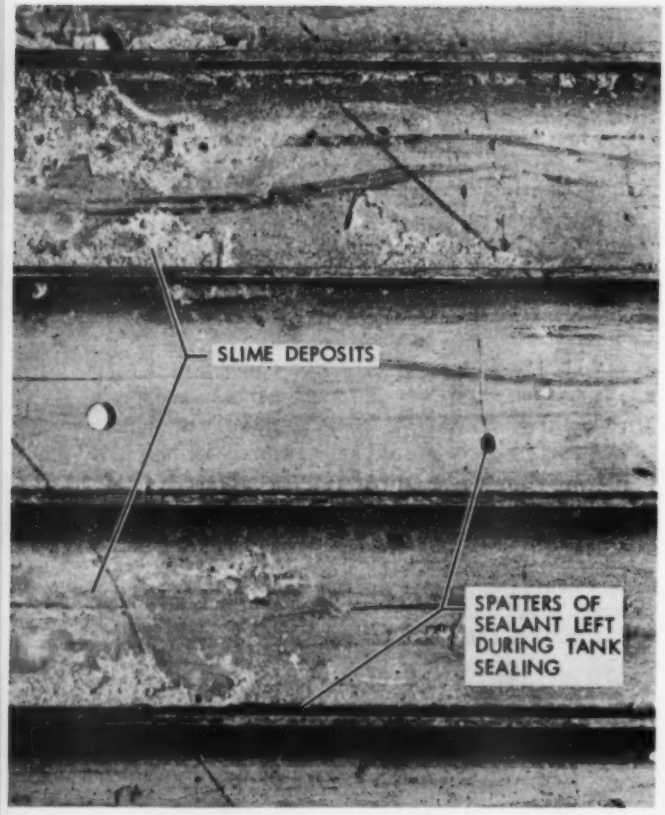
Microbiological contamination and more specifically, fungus, has a high retention capability for water and rust. This growth will cling to all types of surfaces and has been linked to silver corrosion of certain engine fuel pumps, sticking of flow dividers, corrosion of aluminum wing structures, and the malfunction of fuel capacitance probes.

Fuel personnel are alerted to this type of contamination when they can visually detect streamers of grayish brown material extending into the water and fuel layers. Heavy slime and a turbid or opaque layer are also indicative of microbiological activity. In addition, it is not uncommon for the above mentioned visual phenomena to be accompanied by foul smelling odors.

Paramount to ridding a system of microbiological contamination is the removal of the growth environment—*water*. Keep fuel dry and allow for proper drainage at low point drawoffs and the major portion of the battle is won. Daily drainage and sample inspection of tank bottoms, aircraft tanks and filter separator vessels will prevent stagnation and subsequent growth.

In some cases, as in ballasting of ships where it becomes necessary to introduce water into a fuel system, water should be of the drinking quality or sea water taken on while at sea. Harbor, river or

Booster pump intake screen from contaminated fuel tank.



Heavy slime deposits on wing panel (dried condition).

canal water should not be used, since this water should be treated as dilute sewage, highly contaminated.

Floating roof tanks are another source of contamination. Since many fungal spores are airborne they collect on the tank roofs later to be washed down through faulty drains to the fuel.

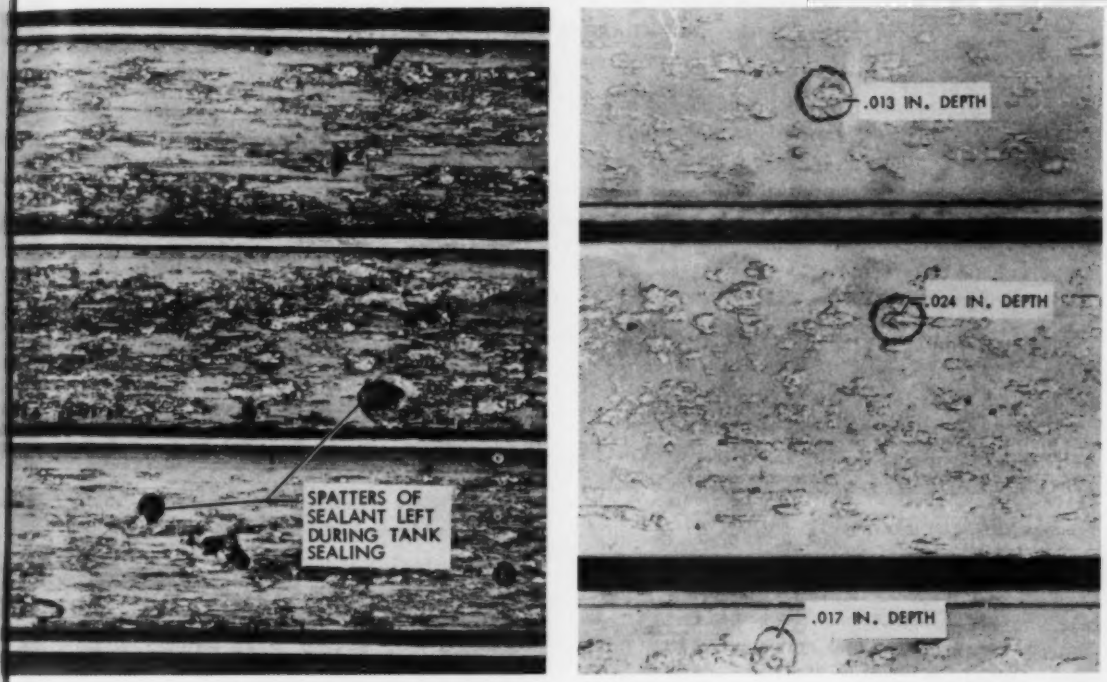
Defueling operations from aircraft which have contaminated fuel also offers another possible mode of contamination. Care should, therefore, be taken to assure that defueled products are free of microbiological contamination prior to mixing with other clean products.

Once microbiological contamination is detected the system contaminated should be isolated, drained, and thoroughly cleaned in accordance with procedures set forth in fuel cleanliness instructions. In no case should the contaminated fuel be transferred or stored where it may further contaminate existing clean fuel systems.

Delivery of a microbiological contaminated product usually signifies a failure somewhere in the fuel cleanup equipment. Continuous monitoring of fuel separator differential pressures, daily sampling utilizing the AEL Mk III Fuel Contamination Detector and the AEL Mk I Free Water Detector and timely changing of filter/separator elements all contribute to maintaining a clean fuel system.

Introduction of biocides offers another aspect of microbiological control. While there is some apprehension concerning the addition of biocides because of the potential problems they may create, there is some evidence that certain additives serve a useful function in controlling microbe growth.

Currently, improved tank coatings have proved



Removal of slime revealed severely corroded wing panel. Panel section (right) was sonically cleaned to remove corrosion.

effective in providing greater protection against corrosion. Primarily, these coatings are of the polyurethane type and although they do not remove the microbiological contamination they, nevertheless, supply the fuel system with a defensive means against possible slip-ups in fueling operations.

All the aforementioned techniques contribute to prevent microbiological contamination, still they are only effective contingent on the operator responsible for the fuel system in question. No fuel system will remain devoid of contamination if the fuel personnel grow lax and negligent in their duties. It is important to maintain constant vigilance by personnel trained to recognize microbiological contamination.

Every effort should be made to:

- Provide clean, dry fuel. (*Please see "Devices for Detecting Free Water in Aviation Fuels," page 43, Oct. '66 issue. Ed.*)
- Visually check the drain effluent from filter separators daily for the presence of black water.
- Visually check aircraft fuel tanks at regular maintenance periods.

If fuel supervisors initiate and follow through on a stringent quality control program, fuel systems will remain clean, products delivered will be of high quality and aircraft will remain up and operating.

Troubleshooting Tip

Experience has shown that fuel probes are the first items that are operationally affected by microbiological growths. Growths on the probe will cause it to short out and give erroneous fuel quantity gage readings. Remember, that if a fuel quantity gage acts abnormally, your troubleshooting might well begin with checking the probes for slime.

Improving the MA Factor

By CDR D.M. Layton,
Staff, PG School, Monterey

Maintenance cadres can be tra

Whenever a group of naval aviators congregate, you can almost be certain that conversation will eventually turn to hairy flight tales, liberty ports, and women. And if these pilots include some COs, maintenance officers, and staff planners the talk will probably turn to MO factor. This magical number which determines the maintenance complement of an activity is really the life-line of aviation maintenance. No one ever has enough people to do the job in the manner that he desires. It seems that to increase the MO factor takes an act of God—or at least of CNO, and if you can improve your maintenance posture by clever management your reward may be a reduction in the MO factor.

Now I have no formulas for increasing this factor with its resultant increase in manpower, but I do have a suggestion on how to improve the utilization of the personnel that you already have. This can be done by increasing your MA factor—your Maintenance Attitude factor.

The maintenance personnel who work on naval aircraft are well trained. From boot camp through Memphis, to the NAMTD, to the squadron on-the-job training programs, considerable concentrated effort is made to ensure that the maintenance cadre has the knowledge to perform the tasks at hand.

Much has been said about the excessive complexity of our modern aircraft and the necessity for designing systems down to the skills available. What many proponents of this method ignore, however, is that we have the latent abilities to improve the apparent skill levels and that, with the proper utilization of what we have, these sophisticated systems will provide the Navy with a greatly improved operational capability. One simple method of improving the utilization of skill level is by increasing the MA factor.

But how can we change the attitude of the maintenance man? Should you fire your maintenance officer and replace him with a psychologist? Or should you just tack up extra copies of General Order 21? Things are not that difficult—nor that easy. Let me outline a few points that may help.

First of all assess your current MA factor. Are your maintenance crews doing a job just to get it done or are they actually working toward an end? Is maintenance performed with a view only to meeting the next sortie deadline, or is there an earnest effort to provide for the long range needs? Is your corrective maintenance really corrective in nature or is the

necessary skill levels, but healthy maintenance attitudes stem from the right kind of leadership.

major effort devoted to piecemeal fixes? These are the real measures of the quality of MA factor.

Once you have realistically determined your standing as regards Maintenance Attitude what steps are available for improvement?

Let us look at a few possibilities.

Much has been written concerning leadership. General Order 21 sets forth certain basic principles that cannot be ignored. Formal programs have been instituted with lesson plans to be used in developing leadership programs. This, I maintain, is not enough. To obtain the necessary MA factor, we need a different approach to leadership—a form of self-leadership called motivation. If we can engender the self-leadership within our maintenance force the MA battle is won. And the process is not as difficult as you might believe. There are many old cliches that although time-worn are quite meaningful. "Rank hath its privileges and rank hath its responsibilities" is one of these.

Delegation of authority is a simple task, but if this can be balanced with the proper award of privilege, an immediate increase in productive output will be sensed.

"An informed man is a happy man" is another of the old sayings that bears attention. How often are your maintenance people told *why* they are doing what they were asked to do? A simple explanation without generalities and without flag-waving is all that is needed to satisfy the restless mind.

These and other factors elementary to basic psychology without labeling them as such can generate a motivative force. And this force, once started, will spread like wildfire throughout your command because there is no pressure that can be brought to bear that has the effect of "peer pressure." If Sam and Charlie and Jim want to do the job in the best possible manner, then the pressure of his peers will bring Joe into line much more rapidly than will directives from a higher echelon.

Power Packaged to Go!

With the incorporation of the nickel-cadmium battery in many naval aircraft, it is essential that maintenance personnel know the important differences between this type of power source and the lead-acid battery. The following information has been compiled from various documents on this subject.

The nickle-cadmium battery is a far superior battery for aircraft use than the more familiar lead-acid type. When properly used and maintained, the nickel-cadmium battery can outlast and outperform its lead-acid counterpart in many ways.

The nickel-cadmium battery can:

- Deliver enough power for engine starts.
- Maintain a steady voltage over 90 percent of its total discharge life.
- Be charged in a short time.
- Be recharged thousands of times without appreciable degradation.
- Perform well at low temperatures.

In addition the nickel-cadmium battery is fully aerobatic, lightweight, does not normally exude corrosive fumes, is easy to maintain, and when necessary, individual cells can be replaced rather than discarding the whole unit.

As in other wet cell batteries, the cell is the fundamental unit of the nickel-cadmium battery. It consists of the positive and negative plate structure, separators, electroylte, container, and cell vent. *There are, however, significant differences between the nickel-cadmium battery and the lead-acid battery. From a maintenance standpoint, these differences are extremely important.* Faulty care and servicing can cause needless destruction of nickel-cadmium batteries, and as a result, flight safety can be jeopardized. The nickel-cadmium battery is also considerably more expensive than the lead battery, another reason why proper care and handling techniques should be emphasized.

Basic Differences

The electrolyte in the nickel-cadmium battery is a solution of potassium hydroxide and distilled water. Chemically speaking, this is just about the exact opposite to the diluted sulphuric acid in the lead battery. This fact, in itself, is reason enough to dictate that the two batteries have separate storage and maintenance areas, since fumes from the lead battery would tend to contaminate the electrolyte in the nickel-cadmium battery. For this reason, *every*

possible precaution should be taken to prevent nickel-cadmium batteries from being touched by, exposed to, or breathed upon by acid—or anything containing acid. This includes equipment such as hydrometers, syringes, and handtools, any of which could contaminate both types of batteries if used interchangeably.

The active materials in the nickel-cadmium battery are, obviously, nickel and cadmium, while lead and lead peroxide are generally used in the lead battery. The electrolyte in the nickel-cadmium battery does not chemically react with the plates as the electrolyte in the lead battery. Consequently, the plates do not deteriorate, nor does the specific gravity of the electrolyte appreciably change. For this reason, *it is not possible to determine the charge state of a nickel-cadmium battery by checking the electrolyte with a hydrometer. Neither can the charge be determined by a voltage test because of the inherent characteristic that the voltage remains constant during 90 percent of the discharge cycle.*

How the Nickel-Cadmium Battery Works

Nickel-cadmium battery plates are constructed of nickel powder sintered to a nickel wire screen. The active materials, nickel-hydroxide on the positive plate and cadmium-hydroxide on the negative plate, are electrically bonded to the basic plate structure. The separators are constructed of plastic, nylon cloth, or a special type of cellophane, and assembled as a cell core with the plates.

The electrolyte, which is a 30 percent by-weight solution of potassium hydroxide in distilled water, does not take an active part in the chemical reaction. It is used only to provide a path for the current flow. At 70°F, the specific gravity of the solution should remain within the range of 1.24 to 1.30.

Charging. When charging current is applied to the cell, the negative plates lose oxygen and become metallic cadmium. The nickel-oxide active material of the positive plates is brought to a higher state of oxidation. These changes continue in both sets of plates as long as the charging current is applied or both materials are completely converted; that is, all the oxygen is driven out of the cadmium oxide plates and only cadmium remains. The nickel-oxide plates pick up the oxygen to form nickel dioxide.

The cell emits gas toward the end of the charging process and during overcharging. The gas is caused by decomposition of the water component of the electrolyte into hydrogen at the negative plates and oxygen at the positive plates. The point of gassing is dependent upon the temperature and the charging voltage. A slight amount of gassing is necessary to completely charge the battery. Consequently, a certain amount of water will be lost.

Discharging. During discharge, the chemical action is reversed. The positive plates gradually lose oxygen while the negative plates simultaneously regain lost oxygen. During this process, the energy is released as electrical current through the discharge load. The rate at which the energy is converted is determined principally by the load resistance.

During the discharge process, the porous plates absorb electrolytes to a point where it is not visible from top of the cells. When the battery is recharged, the electrolyte level rises, attaining maximum level at full charge. For this reason, distilled or demineralized water *should be added only when the battery is fully charged.* This is the exact opposite of the lead-acid battery which must have full electrolyte before charging.

Another unusual characteristic of the nickel-cadmium battery is that when completely discharged, some cells will reach zero potential and charge in the reverse polarity. This action will adversely affect the battery, such that it will not retain a full capacity charge. As a result, it becomes the equivalent of a much smaller-rated battery. The cure for this problem is to discharge the battery and short-circuit each cell to obtain a cell balance at zero potential. This process is known as "equalization." After equalization has been completed, the battery may be charged to its rated capacity.

Use But Don't Abuse

As stated earlier, the nickel-cadmium battery can outlast and outperform the lead-acid battery by a wide margin. This fact, however, should not be construed as meaning the nickel-cadmium battery provides an endless source of power. It has no magic rejuvenating capability and, like all aircraft batteries, it should be used only for its intended purpose—that of starting engines and supplying an alternate source of power in an emergency. *An external power source should always be applied to the aircraft when electrical power is required for trouble shooting and other maintenance functions.*

Servicing

Nickel-cadmium batteries should never be serviced in the aircraft. Because of their unique characteristics, as described in the preceding paragraphs, these batteries do not require as much attention as the lead batteries. Once installed in the aircraft, the main requirement is to keep the battery and battery compartment clean and dry at all times. The battery elec-

trolyte has a high affinity for carbon. Any amount of electrolyte that is expelled reacts with carbon dioxide to form white crystals of potassium carbonate. This substance is noncorrosive, nontoxic, and nonirritating, and can be wiped away with a clean damp cloth. The residue can be loosened with a stiff fiber brush.

Note: Formation of a potassium carbonate on a properly serviced battery installed in an aircraft may indicate the battery is overcharging. Voltage regulator adjustments may be required.

Caution: Never use a wire brush to clean the battery. Severe arcing may result. Do not attempt to clean the battery with solvents, acids, or any chemical solution. Make sure vent plugs are closed during cleaning.

Warning: The potassium hydroxide electrolyte in a nickel-cadmium battery is very corrosive. *Personnel should always wear rubber gloves, a rubber apron, and protective goggles when handling and servicing these batteries. If the electrolyte is spilled on the skin or clothing, the exposed area should be rinsed immediately with water, or, if available, vinegar, lemon juice, or boric acid solution.*

Before attempting to service a nickel-cadmium battery in the shop, maintenance personnel should become thoroughly familiar with the applicable procedures in Avionics Bulletin No. 25 and NavWeps 17-15BAD-1.

As recommended in NavWeps 17-15BAD-1, the first requirement for a service facility is to have *separate shops, isolating the nickel-cadmium batteries from the lead-acid batteries.* Separate areas are necessary to prevent destructive acid contamination. This same rule applies to the separating of servicing equipment, handtools, and gloves. The saving of just one nickel-cadmium battery from acid contamination will go a long way toward paying for the extra precautions.

In addition to keeping the nickel-cadmium batteries isolated, the following servicing tips will prolong battery life:

- Never add electrolyte unless the battery is fully charged. Allow the fully charged battery to sit for at least 2 hours prior to adding electrolyte. The idle period is required because the charging operation drives the electrolyte out of the cell plates, and the electrolyte level does not stabilize for at least 2 hours.
- Do not measure the voltage or the specific gravity of the electrolyte to determine the battery charge. Neither of these factors change appreciably during charge and discharge. The actual state of charge is difficult to determine but can be obtained by following the procedures listed in NavWeps 17-15BAD-1.
- Add only clean distilled water to the battery. Additional potassium hydroxide should not be required.
- Do not allow the battery to dry out.
- Always charge and discharge batteries in a well-ventilated area to prevent a collection of explosive gases.
- Always check all electrical connections and terminal nuts for security and proper torque.
- Do not paint or apply anticorrosive compound to the batteries.
- When replacing cells, use only cells of the same part number, by the same manufacturer. Do not intermix cells in the same battery.
- Keep vent caps in place at all times except when absolutely necessary to remove them. The electrolyte in open cells will absorb carbon dioxide from the air, which degrades the electrolyte.
- Always use tools which are well insulated, to prevent arcing in case they are dropped on the cells.

Safety Is an Important Factor

There is one important safety hazard that should be emphasized. Overfilling the electrolyte in a nickel-cadmium battery when in a discharged or partially discharged state can lead to a chain reaction which would destroy the battery and possibly cause a fire or explosion. As stated earlier, when the nickel-cadmium battery is discharged, the electrolyte is absorbed in the plates. As the battery is charged, the electrolyte level rises. If electrolyte is added to a battery which is not fully charged, the stage is set for a possible catastrophic reaction.

During the first half-hour of flight, there is a tremendous amount of current absorbed by a discharged battery. If the electrolyte level is too high, it will spew through the vent caps. Since the electrolyte contains potash, the cell vents may eventually become plugged. The resulting pressure buildup can rupture the cell case. The spilled electrolyte, which is highly conductive, may then cause intercell or cell-to-case short circuits. The heat generated by the short circuits may establish a chain reaction, causing other cells to spew electrolyte and emit gas. Introduction of a spray into the hydrogen-oxygen atmosphere may likely result in an explosion.

It is also worthy to mention that an overvoltage condition will also cause excessive gas liberation. It is very important that aircraft voltage regulation be checked periodically.

—Adapted from "NAA Service News"

MURPHY'S LAW*

J65 Murphy

Shortly after takeoff on a test flight in an A-4B the pilot experienced smoke in the cockpit followed by slowly deteriorating RPM and EGT. Ram air was selected to clear the smoke and manual fuel control restored normal power. An immediate landing was made with no further difficulty. During rollout oil pressure began fluctuating from 25 to 0 and at shutdown was down to 5 to 0 psi. A total of 6 minutes of flight time had elapsed.

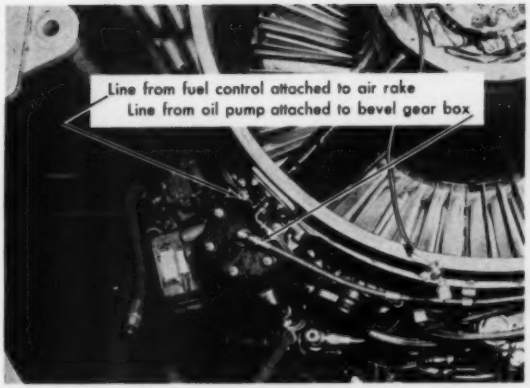
Investigation revealed that during the engine change, the oil scavenge line (PN R20711A-4-0225) to the bevel gear box was connected to the air rake segment of the No. 3 inlet strut and the inlet pressure sense line (PN R21449A-4-0402) from the air rake to the fuel control was connected to the bevel gear box oil outlet port.

The reversal of these two lines (see photos for incorrect and correct installation) allowed oil from the bevel gear box and accessory section to be pumped into the No. 3 strut and out through the engine while the fuel control was receiving false $P+_2$ sensing resulting in decay of power.

Three of the four gallons of oil were pumped overboard during the short flight. It is estimated that another three minutes of flight would have caused complete oil depletion and probably engine seizure.

This particular case points out the validity of Murphy's Law and demonstrates the need for close scrutiny of the HSI (NWO2B-35AAC-2). Figures 2-3 and 2-4 show the proper installation of the Murphied lines.

—MARTD Memphis



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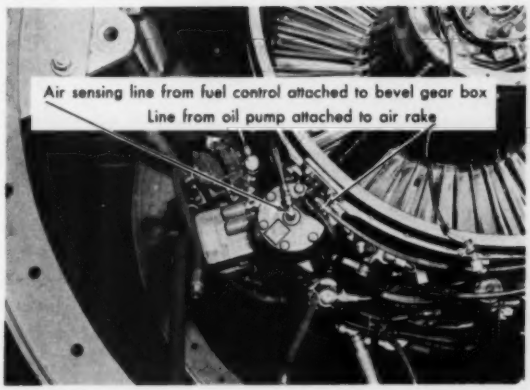
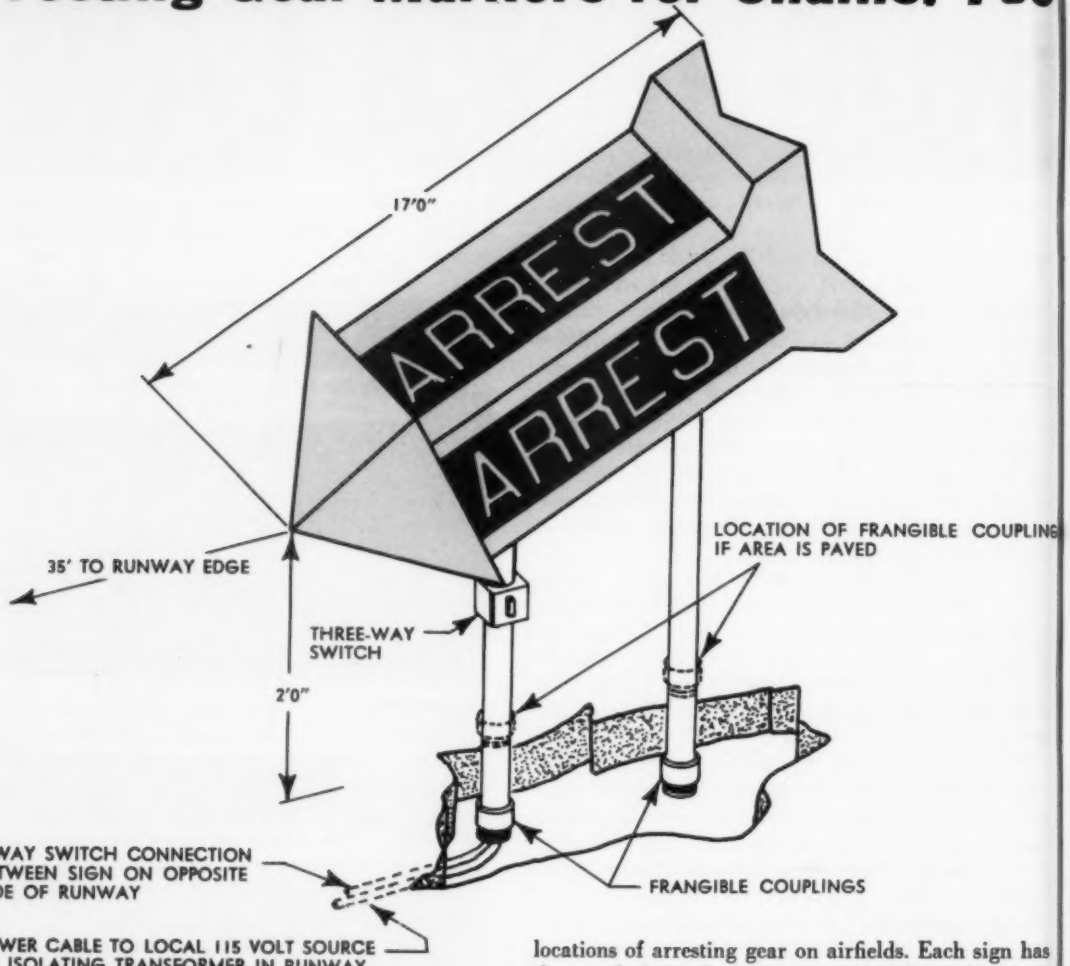


Correct

* If an aircraft part can be installed incorrectly, someone will install it that way!

Arresting Gear Markers for Chains. Too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ARREST
ARREST
35' TO RUNWAY EDGE
LOCATION OF FRANGIBLE COUPLING IF AREA IS PAVED
THREE-WAY SWITCH
2'0"
3-WAY SWITCH CONNECTION BETWEEN SIGN ON OPPOSITE SIDE OF RUNWAY
FRANGIBLE COUPLINGS
POWER CABLE TO LOCAL 115 VOLT SOURCE OR ISOLATING TRANSFORMER IN RUNWAY EDGE LIGHT CIRCUIT

A NEWLY issued document, NavAir 51-50AAA-2, Technical Manual, Visual Landing Aids Design Standards, Landbase Installations, of 1 April 1966 authorizes arresting gear markers for chain type gear.

This publication, together with NavAir 51-50AAA-1 of 1 April 1966 supersedes NavAir 51-50AAA-1 of April 1965.

Heretofore, the use of arresting gear markers for chain type gear was prohibited by General Note (g) of Planning Standards 00-100-505. Air System Command authorities state that the Planning Standard will be amended to reflect the change.

The yellow plastic-lettered flashing signs mark the locations of arresting gear on airfields. Each sign has the word "arrest" on its top and sides, with areas surrounding the yellow letters painted black. One sign is located on each side of the runway. If a chain type arresting gear is used, the signs are in line with the first deck pendant approached by the oncoming aircraft. Because chain gear is single-directional the backside of the sign should be blacked out.

When other type arresting gear is used, the signs are in line with the deck pendant. The signs are mounted on frangible couplings and are removable from the foundation in the event the arresting gear is inoperative.

For a more complete picture of the various types of arresting gear please see the center spread of the March '67 issue.

Letters

Physical Fitness

NAS Brunswick, Me.—Just a note to tell you how thoroughly I enjoyed "High Performance Flyers for Modern Aircraft," April 1967 APPROACH. It is very appropriate in our pushbutton, crash-diet society.

Poor physical condition is undoubtedly a factor in pilot and crew fatigue studies but how closely this is considered is a mystery to me. Perhaps we are designing environmental systems into our new aircraft to suit the tired airman! I can see it now; the aircraft allows the crew to relax physically, its flight systems are sophisticated enough to allow some mental relaxation, a new generation of birds comes along and new requirements for crew comfort are generated ad infinitum. Of course, this is exaggerated but you can look around and see the pallor and flab as close as the mirror if you like.

Flight physicals do not tell all about the whole person and, as you say, the physical deterioration brings a degree of related mental deterioration. This is not always visible to the flight surgeon but on occasion, I have had annuals where the flight surgeon has inquired as to the general state of mind.

Although far from being a physical fitness eccentric, I can't help but feel the need each morning as I climb two flights of stairs to my office. More articles like "High Performance Flyers" are necessary to stimulate airmen to the point that they will recognize physical fitness as a requirement to good, safe flying *and* do something about it.

LCDR C. F. CLARK
ASO

• Thank you for your letter on behalf of the authors, Dr. J. R. McTammany and CDR A. J. Toth.

Ni-Cad Battery Info

Daleville, Ala.—I am involved in an armed service exercise which I feel is faced with a serious servicing problem with aircraft Nickel-Cadmium batteries. As you know, even though the Ni-Cad battery has been around for a long time, servicing problems arise due to the preculiarities of servicing as compared to a lead-acid battery.

I recall reading articles in APPROACH on this subject and request copies. If they can be provided, you will be providing valuable assistance for our program.

H. F. JACOBS

• This topic was last treated in the May '65 issue and a copy forwarded to reader Jacobs. An updated article on Ni-Cads is featured in this issue beginning on page 36.

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request.

Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. 23511. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

Helmet Glue

FPO, New York—For some time now I have noticed countless pilots' protective helmets of both the APH-5 and the APH-6A types in which the white energy-absorbing liner has been eaten away (as per the liner samples I am enclosing with this letter).

This was caused and is presently being caused by many thoughtless air crew survival equipment men who, in their attempt to place a more adhesive bond on the helmet sizing pads, have as the adage tells us, "done a penny's worth of work and a dollar's worth of damage."

The most destructive cement along this line used for cementing laminar seals on the A-13A oxygen masks is called General Purpose Adhesive FSN 8040-598-6913. This adhesive will eat right through helmet liners with devastating effect.

PR1 JAMES D. CENSALE
VQ-2

• Thank you for your letter and the enclosed samples of helmet liner pads. Both were forwarded to the Aerospace Crew Equipment Laboratory (ACEL) as a matter under its cognizance. ACEL has informed us that the cement to be used on the padding in the helmet is adhesive, water resistant, MIL-A-101, FSN 9Z-8040-266-0818. This glue should be used sparingly.

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Vol 13 **approach** No 1

Our product is safety, our process is motivation and our profit is measured in the preservation of lives and equipment and increased mission readiness.

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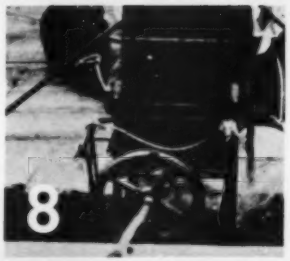
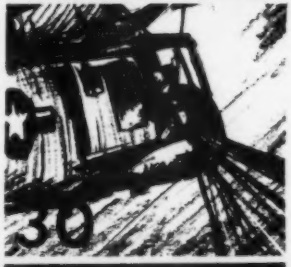
IBC Lift & Drag





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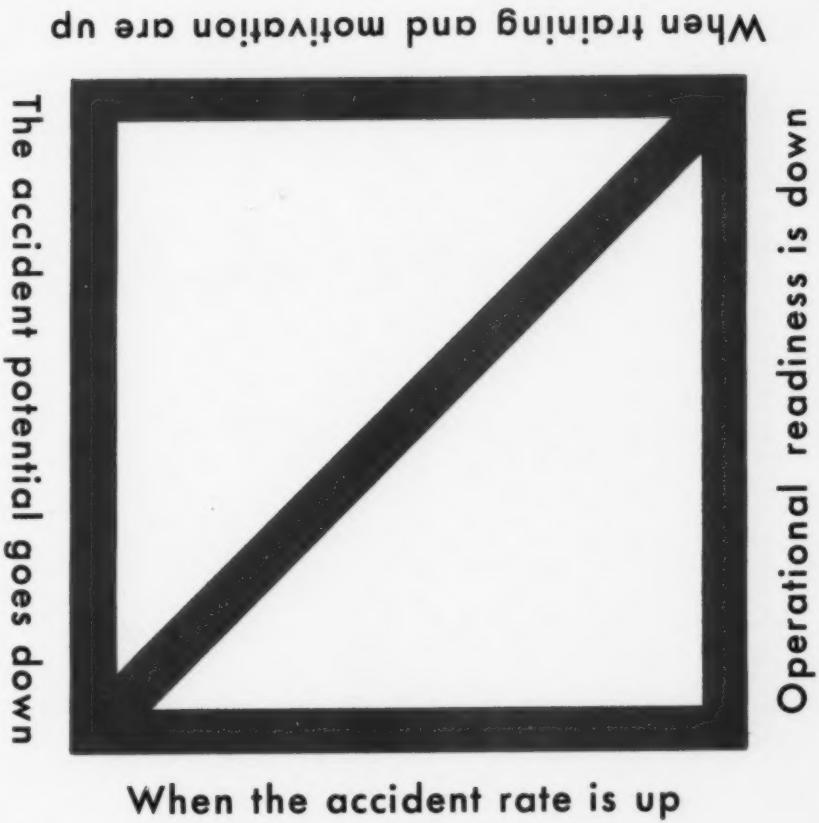
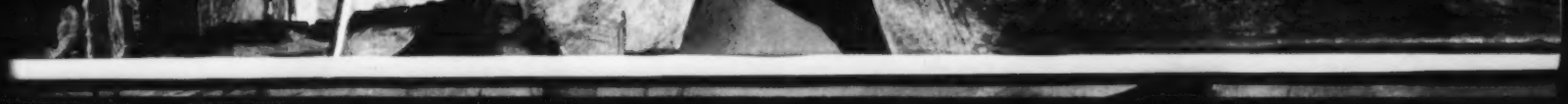
THE RIGHT SLANT / *depends on how you look at it*


When training and motivation are up
The accident potential goes down
Operational readiness is down
When the accident rate is up

Statistics can be made to tell an interesting story.

But the real story is contained in the life that goes on behind the numbers.

No matter how you look at it we still haven't been able to place a value on human life.

LIFT and DRAG

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